THE PAPER INDUSTRY and PAPER WORLD

VOLUME 22
NUMBER 7
OCTOBER, 1940

—FEATURES—

Brown Mechanical Pulp from Yellow Birch....Myron Kin and C. E. Libby 675
Heat and Power in the Pulp Industry.....Max F. A. Wulfinghoff 677
New High-Speed Cleansing Tissue Machine..... 682
Hollingsworth & Whitney's Chickasaw Mills..... 684
Convention Papers . . . Abridged..... 710

—NEWS—

Trade Winds 651
Associations 694
Allied 698
Safety 702
Other Countries .....
Names in the News..... 704
Personals 704
Necrology 709

—DEPARTMENTS—

Theme Page 650
Editorials 663
Current Thought 664
Paper Sketches 693
Coming Events 696
Safety Contest Scores..... 702
New Equipment and Supplies.. 742
Technical Developments 746
Papermaking Patents 748
New Publications 750
Current Market Quotations..... 752
Index to Advertisers..... 755

PUBLISHER
FRITZ PUBLICATIONS, Inc.

Founded by
EDWARD B. FRITZ

A. SCOTT DOWD,
President & Gen. Mgr.

A. C. L. FRITZ,
Vice Pres. & Treas.

A. C. BRUCE, Secretary

HARRY E. WESTON,
Editorial Director

BESSE MERRITHEW, Editor

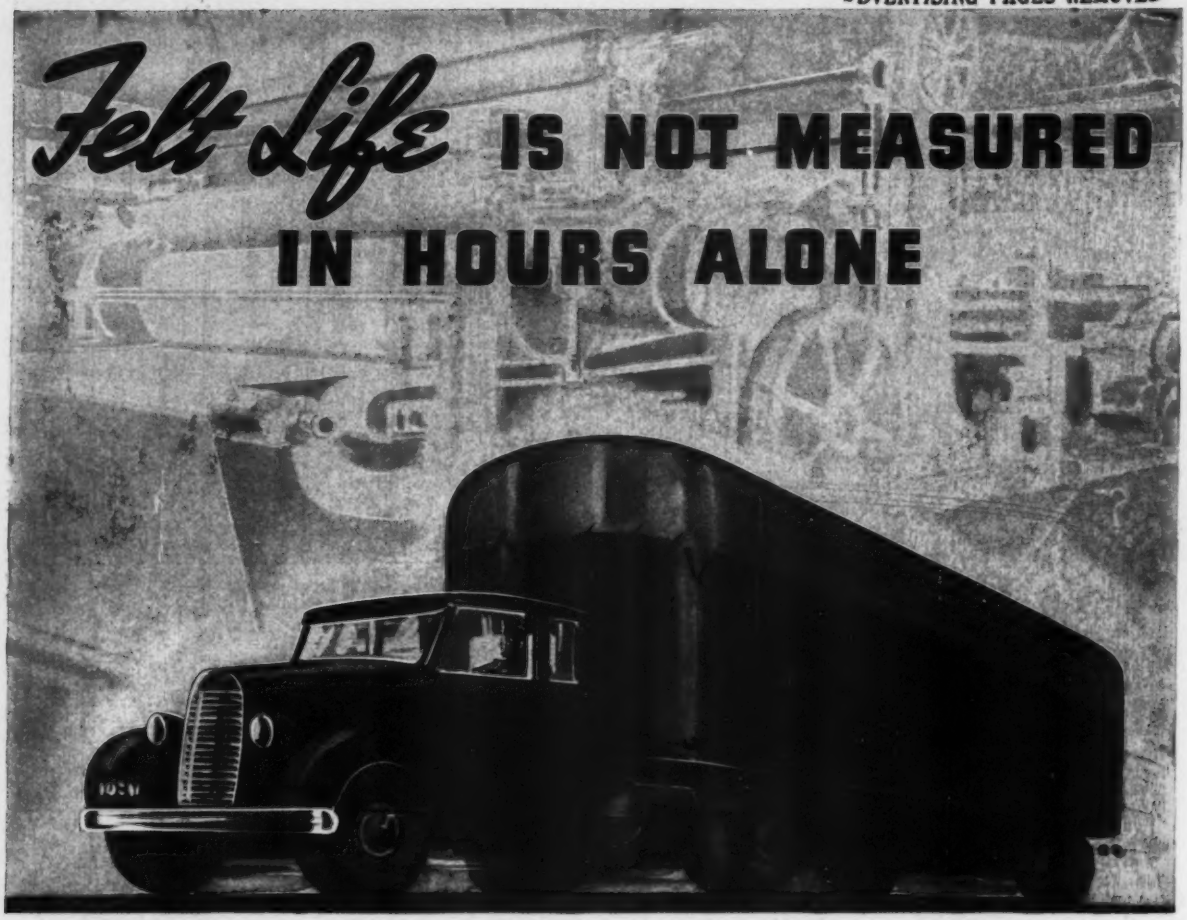
A. L. EKLUND,
Circulation Manager

EDGAR C. FARREN,
Production Manager

Published monthly, on the tenth of the month, by Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill. Eastern Representative: L. D. Schnabel, 9 Rockefeller Plaza, New York, N. Y. Pacific Coast Representative: Norman C. Nourse, 1031 S. Broadway, Los Angeles, Calif. THE PAPER INDUSTRY and PAPER WORLD is a member of the Audit Bureau of Circulations and The Associated Business Papers, Inc. Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879. Subscriptions in the United States, U. S. Possessions, Cuba and Mexico, $2.00 for one year, or $3.00 for two years; Canada, $2.50 for one year, or $3.50 for two years. All other countries, $3.00 for one year, or $5.00 for two years.

Copyrighted 1940 by Fritz Publications, Inc.

THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in *The Industrial Arts Index*.
An index to each volume is issued annually by the Publisher as Section Two of the April number.



YOU MEASURE the life of the tires on your trucks by three factors — the load, the speed and the hours of service. The life of your paper machine felts should be measured in the same terms. Hours alone do not tell the whole story. » » Light squeeze of the presses will lengthen the hours of service but at the cost of inefficient removal of water. Slow speed of the machine will multiply hours of service at the sacrifice of production. » » Heavy pressure, high speed and long hours measure the life of your felts. Apply this triple yardstick in your mill. Hamilton Felts will then become standard equipment on all your machines. They are engineered to withstand the gruelling punishment of the presses and the terrific speed without which economical production would be impossible. Clock and calendar confirm the claims of long life.

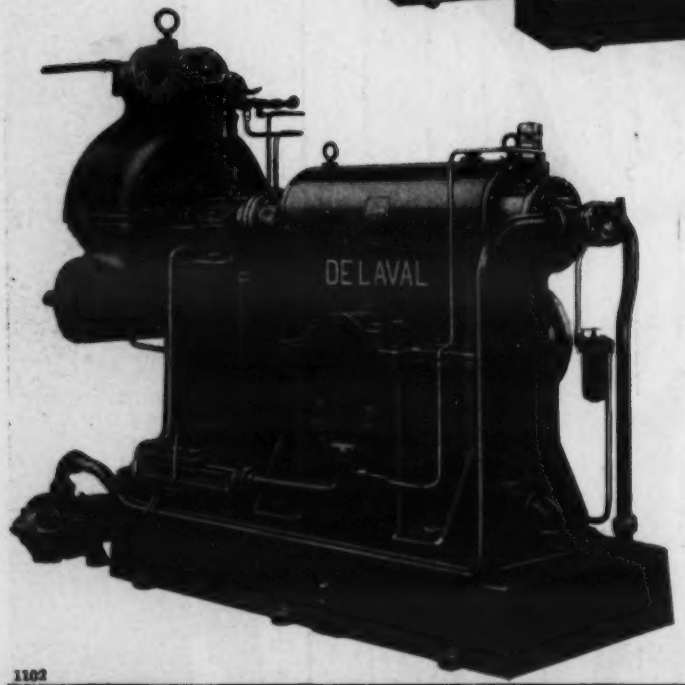
From the thinnest tissue to the heaviest board, there is a Hamilton Felt that will do your work better, faster and at lower cost.

SHULER & BENNINGHOFEN, HAMILTON, OHIO

Miami Woolen Mills

Hamilton Felts

Established 1858



Worm Gear Drives for Induced Draft Fans

● Comparatively large powers are transmitted at high speeds with good efficiency by

DE LAVAL WORM GEARS

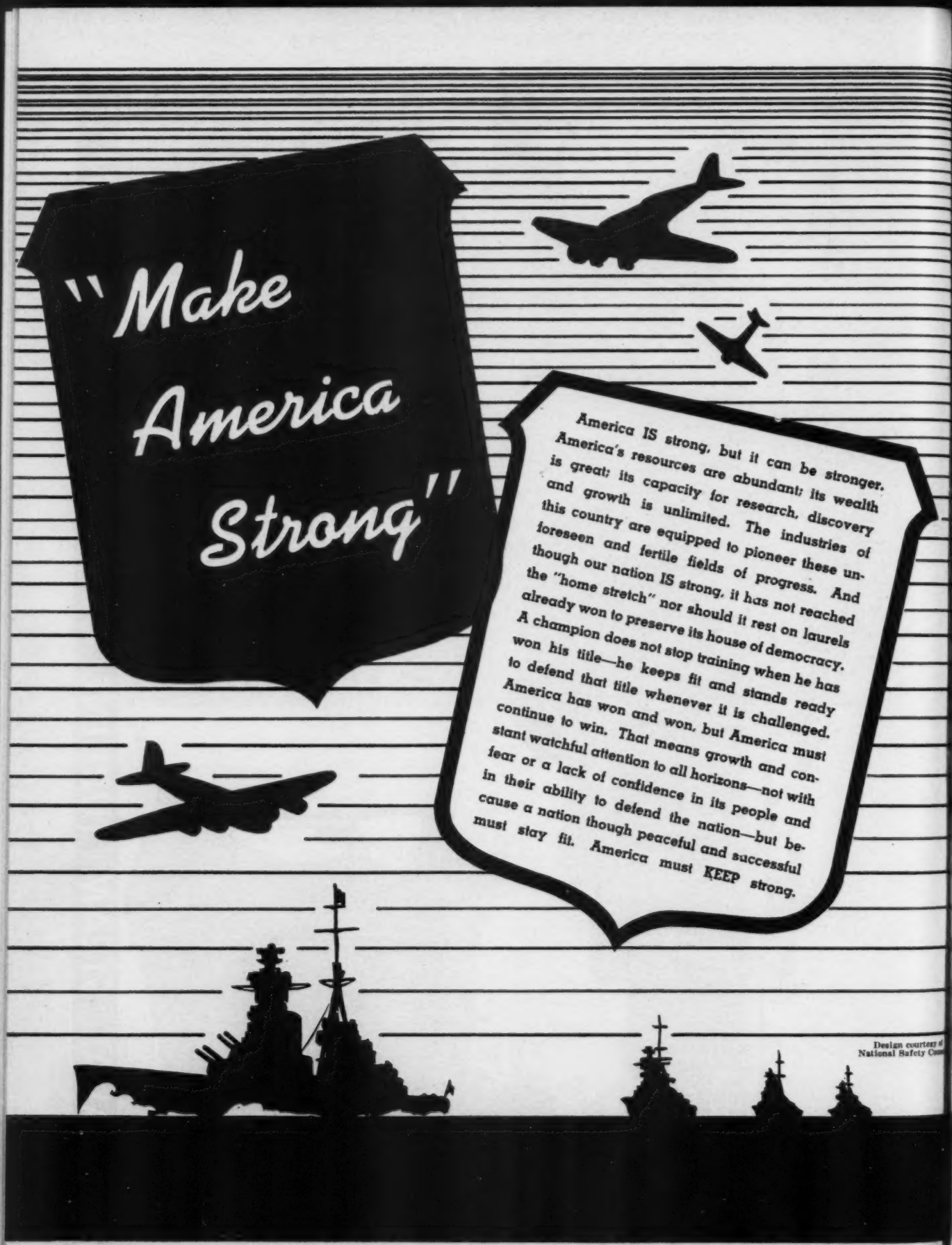
The eight induced draft fan drive units shown in the photograph are rated at 185 h.p. each at 3760 r.p.m. turbine speed. The De Laval velocity stage turbines receive steam at 250 lb. gage and exhaust against 10 lb. back pressure. A De Laval-IMO oil pump, mounted on the end of the worm shaft, forces cooled lubricating oil to the worm and worm wheel and to all bearings. A hydraulic governor controls the speed and there is also an independent over-speed trip-out.

De Laval Worm Gears have been applied successfully in solving a great variety of speed transformation problems where compactness, efficiency and reliability under continuous heavy service were the chief requisites.

Our engineers will, upon request, supply data and suggestions which will enable you to select worm gear units, complete with bearings and casings, suitable for your particular requirements, or to incorporate worm and wormwheel transmissions in machines of your own design.

1102

DE LAVAL STEAM TURBINE COMPANY, TRENTON, N. J.


"Make America Strong"
America IS strong, but it can be stronger. America's resources are abundant; its wealth is great; its capacity for research, discovery and growth is unlimited. The industries of this country are equipped to pioneer these unforeseen and fertile fields of progress. And though our nation IS strong, it has not reached the "home stretch" nor should it rest on laurels already won to preserve its house of democracy. A champion does not stop training when he has won his title—he keeps fit and stands ready to defend that title whenever it is challenged. America has won and won, but America must continue to win. That means growth and constant watchful attention to all horizons—not with fear or a lack of confidence in its people and in their ability to defend the nation—but because a nation though peaceful and successful must stay fit. America must KEEP strong.
Design courtesy of National Safety Council

REFINANCING OF BOND ISSUE APPROVED BY NEPCO STOCKHOLDERS

John E. Alexander

▶▶▶ STOCKHOLDERS of the Nekoosa-Edwards Paper Company, in a special meeting held October 2 at the company office in Port Edwards, approved the plan of refinancing the outstanding $2,000,000 bond issue of the company which was presented to them by John E. Alexander, president and general manager of the company. The plan as adopted had been approved by the directors on September 20.

The outstanding bonds are being redeemed from the proceeds of a new issue of $1,600,000 First Mortgage 4¼ percent Sinking Fund Bonds, due October 1, 1955, and a $400,000 term bank loan due in one to three years, together with other funds of the Company. It is understood that the financing was arranged by the company through Harris, Hall & Company of Chicago, the new issue of bonds being sold privately to two insurance companies and the term bank loan being made by two banks.

As in the case of the old mortgage securing the bonds, the new bonds will be secured by a first lien on the present and future real estate, plants, machinery and franchises of the company, excepting timber and residential properties.

The new bonds will be 15 year serial bonds bearing an interest rate of 4¼ per cent, with annual retirement running from $100,000 to $150,000.

To make up the difference between the new bonds and the amount of the old bonds to be refunded, the stockholders authorized the borrowing of $400,000 from banks on serial notes bearing 2⅜ per cent interest, maturing $100,000 in 1941 and $15,000 each in the years 1942 and 1943.

It is planned, Mr. Alexander states that the refinancing would be made as of October 1 and that the old bonds would then be called for redemption on January 1, 1941, the next interest date. The total sum required for this refinancing operation and redemption would amount to $2,200,000 for principal, interest and premiums. The additional $200,000 required over and above the new bonds and bank loans, Mr. Alexander said, would be paid from treasury funds of the company or may be provided in whole or in part by additional short term bank loans.

The refinancing of the present bond issue will result in a saving of $77,500 in interest costs for the year 1941, on the outstanding $2,000,000 in bonds and a resultant annual saving thereafter of more than $63,500 in cost of interest and premiums. The old bond issue, which was extended in 1936, bears 6 per cent interest and the provisions of the extension were that 1 per cent premium on the principal be included when repaid, which brought the annual rate to 7 per cent.

The present bonds, which will be called and paid on January 1, next, will be at $107 on each hundred dollars of principal.

The refinancing program, Mr. Alexander said, was worked out by him within the past thirty days in co-operation with the Board of Directors and Harris, Hall & Company of Chicago, and has no connection with any other previous negotiations with any other financial institutions or by any effort on the part of any former executive of the company. That question was asked, Mr. Alexander said, at the stockholders meeting as to the origin of the refinancing program and the statement regarding the negotiations was made October 2.

Another question, which stockholders asked and which Mr. Alexander said he answered, was with respect to dividend policies of the company. The new bond issue, being far less restrictive than the old issue will permit a return to stockholders in the form of dividends much earlier, if the earnings of the company justify distribution of profits.

◆

NEW ENGLAND PULP NEWS

Changes that have taken place within the industry include the revival of a mill that was about to be scrapped to make northern kraft pulp for a New England converter; purchase of a paper mill by a tissue manufacturer to insure its sulphite pulp supply through the sulphite plant of the property purchase; announcement of the building of a new southern kraft mill by a New England manufacturer who does not wish to be caught in this position again; the curtailment of operations of a kraft producer by fifty per cent and the selling out of its product over a period of months at this rate to a converting mill because he could not afford to pay current prices for southern sulphate and compete in the paper market at present kraft prices.

Yet the pulp mills are reporting plenty of demand for all the pulp they can make. New England soda, sulphite and kraft producers are operating full

time. Occasionally they secure a premium over the contract market on an export scale but for the most part they are content to take the contract prices on spot business.

There have been no ascertainable instances of spot sales below the contract market, assuming that market to be $63.50 and $72.50 respectively for unbleached and bleached sulphite and $65 for kraft. Several paper mills that have a little extra pulp capacity continue to sell their product freely. Excellent demand is noticed for Mitscherlich unbleached sulphites as well as strong unbleached.

◆

BROWN COMPANY REORGANIZATION

The Brown Company's reorganization is, at last, virtually an assured fact, says a report from the East. A last drive by the committee in charge of securing assents from the bondholders has carried through successfully according to Serge Semenko, vice president of the First National Bank of Boston and reorganization chairman for the company.

Federal Judge John A. Peters has named October 21 as the date when a hearing will be granted, at which time the plan must, of necessity, be approved inasmuch as the five-year reorganization effort has at last, the two-thirds support of bondholders, creditors, and majority vote of stockholders —all that is required by the 77-B amendment to the bankruptcy act.

◆

NEW ADDITION PLANNED FOR PUGET SOUND

A new expansion to the Bellingham plant of the Puget Sound Pulp and Timber Company, Bellingham, Washington, is now being planned. The expansion will permit the plant to manufacture an additional 50,000 tons of pulp per year which will bring the total production to 150,000 tons per annum.

The addition will consist of increased space for the digester building, together with the installation of digesters and circulating system; addition to the boiler plant together with one more boiler; enlargement of the screen and drying room building, and installation of screens, knotters and another fourdrinier drying machine. There will also be the usual installation of acid tanks, towers, blow pits, as well as other auxiliary equipment. It is expected that the addition will be completed by March 1, 1941. It is estimated the new unit will cost about $1,500,000.

FINANCIAL

The resistance manifested by Great Britain to the German blitzkrieg has resulted in a better sentiment on the securities markets, and paper securities shared in the general up-turn.

American Writing Paper Corporation—Net profit for the first half of 1940 was $31,504, as against $36,447 for the same period in 1939.

Celotex Corporation—Net earnings for the quarter ending July 31 were $422,855, as compared with $436,774 for the same quarter of last year. The earnings for the quarter ending April 30, 1940, however, were far below the second quarter figure, being only $77,469.

Central Paper Company—Net earnings for the six months ending June 30 were $442,637, as against $121,328 for the same six months of 1939.

Champion Paper and Fibre Company—Net earnings for eighteen weeks ending August 18 were $819,929, as against $320,377 for the same period in 1939.

Crown Zellerbach Corporation—Net earnings for the three months ending July 31 were only exceeded by one quarter in the company's history, being $2,501,522, as compared with $1,729,874 for the same quarter of 1939. Sales for the quarter established a new record.

Hummel-Ross Fibre Corporation—Net profit for the six months ending June 30 was $365,758, as compared with $37,806 for the same period in 1939.

Masonite Corporation — Profit for the fiscal year ending August 31 was $1,659,348, as against $1,163,050 for the preceding fiscal year.

Oxford Paper Company—A material saving in interest will be effected by the refinancing of $2,551,000 in bonds on the Rumford Falls Power Company, a wholly-owned subsidiary. The saving in interest by substitution of bank loans will be about $40,000 annually.

Paraffine Companies—Net profit for the fiscal year ending June 30 was $1,713,019, as compared with $1,427,897 for the previous year.

Rayonier, Incorporated—Net profit for the three months ending July 31 was $1,593,329, as against $217,516 for the same period in 1939.

Soundview Pulp Company — Net profit for seven months to July 31 was $1,345,053, as against $49,084 for the same period in 1939.

United Paperboard Company—Net profit for the year ending June 30 was $23,559, despite the expenditure of nearly $250,000 in modernization of its plants.

West Virginia Pulp and Paper Company—A profit of $1,875,798 is reported for the nine months ending July 31, 1940, as compared with $400,280 for the same period in 1938-39.

Dividends declared by various paper companies are as follows for September: Union Bag and Paper Corporation, 25 cents per share, as against 15 cents recently paid; International Paper and Power Company, $1.25 on the preferred stock; S. D. Warren Company, 75 cents per share; West Virginia Pulp and Paper Company, 75 cents per share on the common stock.

New York Stock Exchange—Stocks

	Closing Prices Sept. 25 1940	Aug. 26 1940
A. P. W. Paper Co...	*2–2¼	2⅜
Celotex	7⅜	6
Same Preferred....	57	*50–57
Certain-Teed	5½	4
Same Preferred....	33¼	21¼
Champion P. & F. Co.	*22–23⅛	.....
Same Preferred..	*101–102¼	*102–105
Container Corp.....	14¼	13½
Cont. Diamond.....	6½	5⅜
Crown Zellerbach....	15⅜	14¼
Same Preferred....	*87–88½	85½
Dixie Vortex.....	11½	10
Same "A".....	*33–37	33¼
Robert Gair.....	3	2⅜
Same Preferred....	*14½–15¼	12½
Gaylord Container..	12¼	13¾
Same Preferred....	*47–50½	*47–55
International P. & P. Co.....	14½	14¼
Same Preferred....	59	58¼
Kimberly-Clark	*35¾–38	*33–34¼
MacAndrews & Forbes	*28¾–29	29
Masonite	28	25½
Mead Corp.	*8⅜–9⅛	8⅜
Same Preferred....	*75–78	*77–80
Paraffine Co.	*37½–38	32¾
Same Preferred....	*97½–100	*94–98½
Rayonier	17	16¼
Same Preferred....	*29–30	27⅜
Scott Paper	*42–43	38
Same 4½% Preferred	113½	113
Same 4% Preferred	*108–109	106½
Sutherland Paper....	*24¼–26	*23–24⅜
Union Bag & Paper	12¼	11⅜
United Paperboard..	*3½–3⅞	*3⅛–3¾
U. S. Gypsum.....	80¼	69
Same Preferred..	*174–175	182

New York Stock Exchange—Bonds

Certain-Teed 5½%	81	78
Champion P.&F.Co.		102¼
Inter. P. & P. Co. 5%	102¼	102¾
Same 6%	102⅞	102½

New York Curb Exchange—Stocks

Am. Boxboard.....	*5–5¼	*4½–4¾
Brown Co. Pfd.....	20	*17–19¾
Great Northern.....	*40–41	40½
Hummel-Ross	6⅛	6¾
Nat. Container.....	11½	10¾
St. Regis	3	3
Taggart	3⅜	*3¼–3½
United Wallpaper....	1¾	1⅞

*Closing Bid and Asked Prices.

"It made the children laugh and play"

. . . to see the Lamb from page 38 at school on page 37

But the Teacher cried unhappily, "Please go back to your fold."

"I wish I could," the Lamb said. "But I'm *show through* . . . from the Mother Goose rhymes on the next page."

"But you can't just stand there in the middle of a lesson."

"I can unless you speak to the paper maker."

"About using Krebs Pigments?"

"Certainly. Any paper maker ought to know that Krebs Pigments can easily take the *show through* out of even thinnest paper," said the Lamb, pirouetting on an ink well.

" 'Opacity' is the word, I believe," prompted the Teacher. "And please stand still before you mess up my desk."

"Speaking of cleanliness," the Lamb went on, "you ought to see the clean whiteness that Krebs Pigments give to paper. Brightness, too. With sharp, clear printing on both sides."

"Think of it," said the Teacher. "Will the Krebs people help us get on with our lesson?"

"They're glad to help with technical information," said the Lamb. "You just write."

KREBS PIGMENT & COLOR CORP.
1007 Orange Street...Wilmington, Delaware

$2,000,000 EXPANSION PROGRAM AT ECUSTA

▸▸▸ A VAST EXPANSION program which will probably entail the expenditure of about $2,000,000 is now being undertaken by the Ecusta Paper Corporation, Brevard, North Carolina. Announcement of plans for the expansion was made by Harry H. Straus, president of the paper corporation. Contracts for construction activity have already been let and preliminary construction work has begun.

New building facilities to cover about ten acres will consist of additions to present structures. New land necessary for the expansion program has been acquired and a new railroad spur has been laid out. The additions, as outlined by Ecusta officials, will consist of projections on building units occupied by the washer department, bleaching department, finishing room, machine room, turbine rooms, boiler room, warehouse and filter plant. Complete plans have not been announced as to structures to be added to one or two units, including the refining department.

The plans of the Ecusta organization indicate that the additional facilities will be ready for operations in about a year. J. E. Sirrine and Company, Greenville, South Carolina, is handling the engineering work while the Fiske-Carter Construction Company, also of Greenville, is handling the actual construction. Three large paper machines are to be installed in the new structures.

The enlargement program was made imperative, Mr. Straus stated, to meet demands being made to the concern by leading cigarette manufacturing companies. It was pointed out that the plant is now working on four shifts, maintaining continuous operation and that full-time operation is assured for the future. In addition to contracts already made, it was claimed that the company is receiving inquiries and quotations from all parts of the world.

The first unit of the Ecusta Paper Corporation was started in June, 1938, and work continued until the plant began operation in August, 1939. Cigarette paper was made from raw flax a year ago.

Prior to this, most of the cigarette paper was procured from France because of the belief that certain qualities of water were needed to produce such paper. The Champagne Corporation, of New York, was one of the largest importers and distributors of French paper and it was this firm who foresaw the possibility of making the paper in the United States. The Champagne Corporation and officials of the future Ecusta Paper Corporation began study of an experimentation with American flax and American water. Successful experiments led to choosing a site in North Carolina on the Davidson River.

SCOTT PAPER BUYS ANACORTES MILL

The Scott Paper Company, Chester, Pennsylvania, has contracted to buy on November 15, the Anacortes Pulp Mill, Anacortes, Washington, President Thomas B. McCabe announced recently. This is the second pulp mill acquired by the Scott Paper Company in the Northwest this year, the Pennsylvania firm having purchased the entire outstanding capital stock of the Coos Bay Pulp Corporation, Empire, Oregon, in June (cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 323, July, 1940).

The Anacortes Mill, formerly a unit of the Puget Sound Pulp and Timber Company, has a rated annual capacity of about 30,000 tons of unbleached sulphite pulp and will be the third pulp producing unit that the Scott Paper Company owns. The other two are the Nova Scotia Wood Pulp and Paper Company at Charleston, Nova Scotia, and the Coos Bay Pulp Corporation. Scott also owns one-half the common stock of Brunswick Pulp and Paper Company, Brunswick, Georgia.

This recent purchase, when completed, will be another step in strengthening the company's raw materials position, Mr. McCabe pointed out, also stating that the net sales of Scott products, for the first eight months of this year, amounted to $12,876,300. This represents an increase of 11 per cent over the same period last year.

◆

WATER TREATMENT PLANT FOR K-C

A new water treatment plant with a reported capacity of eleven million gallons per day is now under construction at the Kimberly-Clark Corporation's Niagara Falls (New York) plant.

The new unit will consist of two 52 ft. dia. x 16 ft. deep basins with International Filter Company accelerator clarified equipment and auxiliaries. A pump room is provided for two 5,000 g.p.m. centrifugal pumps to Nos. 1 and 2 mills. Also included in the installation is a sump pump, high pressure pump and auxiliary piping. An operating floor will be provided at the top of the basins in which will be placed the chemical dry feeders, sampling table and electrical equipment. A second floor will provide room for chemical storage.

The plant is designed for fully automatic operation after start-up. However, an alarm system is to be placed in the mill which will warn the operator if any piece of equipment is not functioning.

The underground portion of the plant will be of reinforced concrete construction with a superstructure of modern design. The architectural design is by Skidmore, Owings and Merrill, Chicago. Total cost of the plant is estimated at $185,000. It is expected that the new K-C plant will be in operation around the middle of December.

◆

WISCONSIN PAPER GROUP HAS MEETING

Fifty representatives of about 18 paper mills attended a meeting of the Wisconsin Paper Group in Wisconsin Rapids on September 10. The group is a non-profit organization for the consolidation and forwarding of paper shipments from Wisconsin to other points in the country. Traffic and shipping problems were the main topics of discussion. H. D. Wake, of the Consolidated Water Power and Paper Company, was in charge of arrangements for the affair. Henry F. Fredlund of Nepco assisted him.

◆

SPR AIDS TISSUE LABELING PLAN

The recent revision of Simplified Practice Recommendation R46-39 has permitted the manufacturers of tissue paper for wrapping purposes, to materially improve their labeling plan so that it now affords a greater protection than ever before to buyers of this type of paper. The Tissue Association, taking advantage of the change which eliminated the old label from the SPR, has brought out and copyrighted a new two-color label.

Manufacturers of wrapping tissue are being licensed to use this label under strict regulations which guarantee that the paper meets the standards set forth in the Recommendation. The license agreement signed by these manufacturers carries with it adequate provision for testing and furthermore permits of policing the use of the labels as was not previously possible.

Here's Why Armstrong-Stamm Can Give You a "TAILOR-MADE" Dryer Drainage System*

* AT MODERATE COST

IT is axiomatic in the paper industry that no two mills have exactly the same operating conditions. For this reason, Armstrong-Stamm engineers have consistently followed the policy of treating each machine as an individual problem and have applied only the equipment actually needed to produce desired results. Such a policy is possible only because Armstrong-Stamm first developed and perfected what is believed to be the most complete and most modern line of special units offered to paper mills today.

Let us show you how you can have a tailor-made drainage system for each machine and still save money on total cost. Write—no obligation.

ARMSTRONG MACHINE WORKS

GRADUATED TEMPERATURE CONTROL SYSTEMS
•
MOISTURE CONTROL SYSTEMS
•
DRAINAGE SYSTEMS

PAPER MILL DIVISION
816 HOFFMAN STREET
THREE RIVERS, MICH.

RECORDING AIR RELIEF CONTROLLERS • AIR RELIEF VALVES • MOISTURE CONTROL DETECTORS • DRYER DRAINAGE RESTRICTORS • DRYER AIR EJECTORS • GRADUATED TEMPERATURE CONTROL VALVES • DRYER DRAINAGE UNITS • STEAM TRAPS • HUMIDIFIERS

EVEREST - BOYCE AID DEFENSE COMM.

D. C. Everest, president of the Marathon Paper Mills Company, Rothschild, Wisconsin, has been appointed group executive of the National Defense Advisory Commission's Pulp and Paper Section, it was announced recently by Edward R. Stettinius, head of the Industrial Materials Division. In addition, it was announced that Charles W. Boyce, vice president of the Northwest Paper Company, Cloquet, Minnesota, has been appointed assistant group executive on the Pulp and Paper Section of the Defense Commission. Mr. Everest is a former president of the American Paper and Pulp Association; Mr. Boyce was formerly executive secretary of the same organization.

D. C. Everest

Charles W. Boyce

SCANDINAVIAN PULP MAKERS FORM CARTEL

While domestic pulp producers are announcing that there will be no increases in pulp prices before the end of the current year, the Scandinavian producers have formed a strong cartel, under German control, to be prepared for any European pulp industry price control that may be possible when the war ends, even to the establishment of sufficiently low prices to regain the American market at any cost. A rigid control of all major phases in the European pulp industry is contemplated by the cartel.

A follow-up of a cablegram received by the American Paper and Pulp Association from Stockholm stated that during the last four months of 1940 the Netherlands will take 12,000 tons of sulphite pulp, Belgium will take 18,000 tons of sulphite and both countries will take 11,000 tons of sulphate pulp; 5,000 tons of which is to be supplied by Sweden. Sweden is to supply 10,000 tons of sulphite pulp with Germany supplying a like amount and the other Scandinavian countries supplying the rest.

It is clear that Germany now controls all pulp production in Europe with the exception of that of Russia. For the present the cartel will have no effect on American prices or supplies. The action of Finland in permitting German troops to pass through that country to Norway where they could be used against England, may cause Great Britain to take steps to blockade the Finnish port of Petsamo which was able to ship 11,000 tons of pulp to the United States in August.

Meanwhile the American pulp manufacturers are expecting large supplies of pulpwood from Canada during the coming year. The cut along the north shore of Lake Superior, for instance, has been the largest on record.

◆

STUDY STREAM POLLUTION IN NEW ENGLAND

Demand for a study of stream pollution has come to the forefront in Massachusetts and Maine, two states in which paper and pulp mills have gone to considerable trouble and expense to overcome this trouble.

United States Public Health authorities have been asked to survey the Androscogin River in Maine and in New Hampshire. Many paper and pulp companies are located on this river but much of the bad condition, it is said, is due to municipalities without proper filtering equipment that render the water impure or unfavorable for the paper mills.

Frederic C. Clark, consulting engineer of Newton, Massachusetts, recently identified a northern New England paper mill as a prime example of how that industry has taken care of its waste liquors, by becoming an almost a "closed operation" and reducing their water intake from 40,000 to 1,000 gallons per ton of newsprint produced. Inasmuch as this mill is said to make some 400 tons of newsprint daily, it is an important contributor to improving the condition of the water, it was pointed out.

◆

NO CHANGE IN PULP PRICES FOR THIS YEAR

Major Canadian producers have informed customers that third quarter pulp prices will continue into the fourth quarter of this year. On the basis of United States Atlantic seaboard ports, pulp prices for an air-dry ton of 2,000 pounds will be maintained as follows:

Bleached Sulphite	$72.50
Unbleached Sulphite	63.50
Bleached Sulphate	82.50

Soda pulp will continue at $66 for an air-dry ton of 2,000 pounds delivered to United States mills. Groundwood pulp will continue at $45. Wood cellulose pulp for rayon yarn, Cellophane, plastics and allied products will continue at $75 per ton.

◆

BOILER ROOM IMPROVEMENTS IN NEPCO MILL

The remodeling of the boiler room of the Port Edwards mill of the Nekoosa Edwards Paper Company has been completed.

The new Babcock & Wilcox type E-26 ball mill coal pulverizer is now in operation and new burners were also installed on the No. 3 boiler. The new unit, designed for the high moisture content and hard grinding Western coal, has a capacity of 8,000 pounds per hour. With the old pulverizer it will make about 100,000 pounds of steam per hour.

The Detrick Company has installed additional air-cooled walls and new diamond soot blowers have been added. The Nepco power program is so designed as to permit Western as well as Eastern coal to be burned at both the Port Edwards and Nekoosa mills.

New High in Papermaking at Mobile, Ala.

•

Outstanding Puseyjones Features in great New Plant of Hollingsworth & Whitney Co.

•

The great new pulp and paper mill of the Hollingsworth & Whitney Company at Mobile, Ala., brings together once again two of the best-known names in papermaking.

Since 1892, Puseyjones engineers and designers have kept pace with the demands of Hollingsworth & Whitney for the largest, fastest papermaking machines that could be built, each equipped with the latest exclusive Puseyjones features.

In the new Hollingsworth & Whitney mill at Mobile, the 184" Fourdrinier all-purpose Machine was built by Puseyjones for manufacturing practically all grades of brown, semi-bleached and fully bleached Kraft papers. It is equipped with these outstanding Puseyjones features:

(1) Rapidrape Method for installing Fourdrinier Wires.
(2) Duplex High-Speed Shake Attachment.
(3) Improved Enclosed High-Speed Dryer Gearing.
(4) Improved Marking Press Attachment.
(5) Improved Size Press Attachment.

•

In the same mill, the 124" Four Cylinder Machine for manufacturing high quality boards over a wide range of weights and characteristics is equipped with such exclusive Puseyjones features as the following:

(1) Stream Flow Vats.
(2) Up-Flow Head Boxes.
(3) Improved Size Press Attachment.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-making Machinery. Wilmington, Del.

WASHINGTON •

▶▶▶ THE APPLICATION OF THE WAGE AND HOUR LAW to the production of converted paper goods will come before a Washington committee on October 14. The Committee is authorized to fix rates in this branch of the paper industry, but the committee is entirely separate from that formed to handle this question for the paper mills themselves. The producers of paper boxes, envelopes, bags and other forms of converted paper are represented on the committee by well-known manufacturers; labor union officials will represent the employes and a group of college professors of economics will represent the public.

▶▶▶ NINE MEMBERS of the transparent materials industry have been ordered by the Federal Trade Commission to desist from maintaining uniform prices in the Cellophane and allied field.

▶▶▶ CONSENT DECREES have been agreed to by the Kraft Paper Manufacturers Association and also the National Container Association, accused of conspiring to violate the anti-trust laws, and the signing of a decree by Judge Gaston L. Porterie in United States District Court, New York, disposes of the charges against the two associations. The decree includes thirty-eight individuals connected with the Kraft Paper Association and sixty-four in the container case.

Wage and Hour Div. Enforce Minimum Wage

The manner in which the Wage and Hour Division of the Department of Labor is following up its efforts to force the payment of 30 cents per hour to pulpwood cutters is shown by the application for an injunction, filed at New York, against the interstate shipment of any kraft paper, pulp or other paper products made by the Southern Kraft Corporation. Similar action was taken against the West Virginia Pulp and Paper Company. The injunction is asked under the so-called "hot goods" clause of the Wage and Hour Act, which forbids the interstate shipment of goods made in violation of the act. Both companies have secured their pulpwood from contractors who are responsible for the production of pulpwood though the companies own some of the land from which the wood is cut. The plea for an injunction admits that the paper companies buy the wood from the contractors, but holds that the low wages are paid with the knowledge of the paper companies. The answer of the paper companies will doubtless be that they are purchasers of wood, and not responsible for the wage rates paid by those who sell them their raw material.

These applications for injunctions follow the indictment of a number of companies operating in the South for alleged conspiracy in holding down the wages of timber cutters.

While these agencies of the Government are seeking to increase the cost of material used by the paper mills, other branches of the Government are, in the name of national defense, demanding that paper prices be held down.

In some parts of the country paper companies are notifying their pulp wood suppliers that they will not accept wood produced by labor at less than the provisions of the Wage and Hour Act.

▶▶▶ IN ADDITION TO THE sixteen Nekoosa-Edwards Paper Company employees who are members of the Wisconsin National Guard and are therefore subject to call when the Wisconsin guard goes into active duty, seven other employees have resigned their jobs to enlist in the regular army.

▶▶▶ SEVERAL COMPANIES have made inquiries indicating that in the paper trade, an impression had been created that the price of paper had been discussed with representatives of the Advisory Commission to the Council of National Defense, says a report from E. W. Tinker, executive secretary of the American Paper and Pulp Association. Mr. Tinker points out that the discussion, insofar as prices are concerned, revolved around the situation with relation to pulp supplies and not paper.

▶▶▶ ATTENTION IS CALLED to the fact that September 16, 1940, was the effective date of the Order of the Wage and Hour Division of the United States Department of Labor establishing a minimum rate of forty cents per hour for the pulp and primary paper industry. This rate is applicable to both male and female employees without regard to plant location.

▶▶▶ AT THE PRESENT TIME, Army and Navy specifications permit only cotton linters to be used as a base for nitro-cellulose explosives. Since these linters must be sold to the powder plants in bleached form and the capacity of the existing bleaching plants is apparently far short of the new requirements, certain individual pulp and paper mills may be interested in using such excess bleaching capacity as they may have for bleaching cotton linters.

▶▶▶ INDUSTRY COMMITTEE No. 14, investigating economic and competitive conditions in the converted paper products industry with a view to recommending a minimum wage, was to have held a public hearing on October 10 in Washington, D. C. The committee of 27 members, equally representative of the public, the employers and the employees, was called to Washington for the purpose of conducting a hearing by Wayne Lyman Morse, dean of the University of Oregon's law school.

◆

ADD NEW NAMES TO PAPER IND. DEFENSE COMM.

The Defense Committee of the Paper and Pulp Industry, now completely organized, includes the names of H. A. Legge, Howard Paper Company; George R. Wallace, Fitchburg Paper Company, and J. L. Riegel, Riegel Paper Corporation. These are in addition to the committee members announced previously (Cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 534 Sept. 1940.) R. A. Hayward, Kalamazoo Vegetable Parchment Company, is chairman of the committee.

◆

GERMAN PAPERS STILL REACH U. S.

German specialty papers, barred from shipment across the Atlantic by the British blockade, are reaching the United States by shipment across Russia to Vladivostok, thence across the Pacific and across the United States to New York City, according to the Import Committee of the American Paper Industry.

PAPER

13 million tons* of it!

GENERAL CHEMICAL COMPANY ***products for the Paper Industry:*** **Aluminum Sulfate** ***(Standard and Iron Free)*** • **Sodium Silicate** • **Zinc Chloride Solution** • **Glauber's Salt** ***(Crystal or Anhydrous)*** • **Sodium Sulfide** • **Sodium Bisulfite** ***(Solution or Anhydrous)*** • **Crystal Alum, Potassium** • **Salt Cake** • **Trisodium Phosphate** • **Sodium Metasilicate** • **Sodium Hyposulfite Muriatic Acid** • **Sodium Sulfite Anhydrous** • **Sodium Aluminum Sulfate** • **Epsom Salt** • **Nitre Cake** • **Sulfuric Acid**

GENERAL CHEMICAL COMPANY

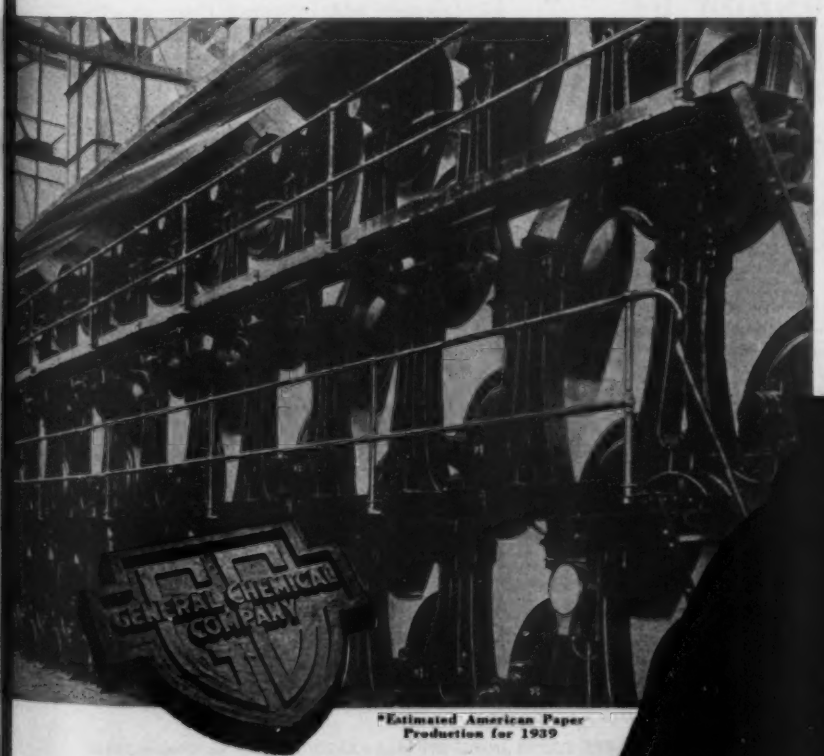
40 RECTOR STREET, NEW YORK, N. Y.

Sales Offices: Atlanta • Baltimore • Boston • Buffalo • Charlotte (N. C.) • Chicago Cleveland • Denver • Houston • Kansas City • Milwaukee • Minneapolis • Montezuma (Ga.) Newark (N. J.) • New York • Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis Utica (N. Y.)

Pacific Coast Sales Offices: San Francisco • Los Angeles

Pacific Northwest Sales Offices: Wenatchee (Wash.) • Yakima (Wash.)

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



*Estimated American Paper Production for 1939

BRIEFS

▶▶▶ HIGHLIGHTING THE northbound movement of southern kraft pulp was an unfortunate fire that broke out at Pier 47, Boston. The fire caused $40,000 damage to the pulp and other cargo that had just been discharged from the freighter "Bayou Chico" in from southern ports. Much of the pulp was saved by the quick action on the part of fireboats and their crew.

◆

▶▶▶ SALE OF THE Kalamazoo Paper Box Company's plant to the Shakespeare Company, manufacturers of fishing tackle, was announced by President Richard Staebler of the box firm. The box company will move its equipment to another Kalamazoo building of about the same size.

◆

▶▶▶ BRITISH COLUMBIA NEWSPRINT EXPORTERS do not expect to suffer any net loss in sales to Australia as a result of the proposed new paper rationing program in the commonwealth. Present indications are that Australia will reduce consumption of paper by 25 to 30 per cent. This would be a severe blow to British Columbia were it not for the fact that the United Kingdom which ordinarily supplies Australia with about 40 per cent of its paper, is unable to maintain its exports.

◆

▶▶▶ SAWLOG CUTTING RIGHTS on about 700 square miles of pulpwood limits in the Lake Head area, Ontario, have been granted to the Great Lakes Lumber Company, it was announced recently.

◆

▶▶▶ WHEN MASSACHUSETTS VOTERS mark their crosses on election day next month they will be using a sheet of Tileston & Hollingsworth Company's Natural White ballot stock.

◆

▶▶▶ GASPESIA SULPHITE COMPANY, Chandler, Quebec, plans to commence work shortly on a $100,000 program of improvements and additional installations to its pulp mill, with a view to increasing capacity.

◆

▶▶▶ CANADIAN WRAPPING PAPER is now being used in the Fiji Islands, according to a recent report. Other unusual markets for Canadian paper are Palestine, the Straits Settlements, British Honduras and Tobago.

▶▶▶ THERE IS GREAT ACTIVITY in the forestry industries in Canada and preparations are going ahead for record cuts of pulpwood and lumber during the coming season. In addition to the demand of the pulp and paper industry, orders for lumber are piling in from Great Britain. About 12,000 men will find employment this winter in the timber camps of three paper companies operating in the Lake St. John district of Quebec. The three firms — Price Brothers, Consolidated Paper Corporation and Lake St. John —will cut more than 1,000,000 cords it is estimated.

◆

▶▶▶ THE NISSO RAYON PULP COMPANY and the Canada Lumber Company, two Japanese firms holding timber concessions in Canada, imported to Japan in the fiscal year just ended, some 45,000,000 board feet of lumber. Of this total 24,000,000 was imported on behalf of the Nokuestu Paper Company for the manufacture of pulp.

◆

▶▶▶ EXTENSIONS AND IMPROVEMENTS to the Restigouce Company's mill are now being planned, it was reported recently. The company will purchase about $75,000 worth of equipment for the manufacture of bleached sulphite and rayon pulp.

◆

▶▶▶ A NEW MODERN builders workshop where the many types and colors of asphalt shingles, insulated sidings, floorings, insulation, etc., can be seen and compared, has been provided by the opening of a new display room by Building Products, Ltd., Montreal.

◆

▶▶▶ IMPROVEMENTS TO THE NEWSPRINT MILL of the Quebec North Shore Paper Company, a wholly owned subsidiary of the Ontario Paper Company, are now being planned. The work will involve an outlay of over $100,000 including machinery.

◆

▶▶▶ HOWARD SMITH PAPER MILLS, LTD., Montreal, has awarded the general contract for the construction of a one-story addition to the mill at Cornwall, Ontario, to A. F. Byers and Company. The addition will cost about $50,000.

◆

▶▶▶ PROSPECTS FOR ENDING the receivership of Lake Sulphite Pulp Company seem brighter at present, as a result of recent discussions. Progress has been made in the latest negotiations and if final differences can be adjusted announcement of a reorganization can be looked for.

COTTRELL PROCESS OF
ELECTRICAL PRECIPITATION

universally recognized as a
standard method of removing
DUST, FLY ASH, FUME, MIST & FOG
from GASES

28 years of research development and operating experience by the affiliated Cottrell Companies throughout the world is incorporated in the

COTTRELL INSTALLATIONS

offered to meet the requirements of any problem by

RESEARCH CORPORATION

405 LEXINGTON AVENUE, NEW YORK CITY — 59 EAST VAN BUREN STREET, CHICAGO, ILL.

associated with

WESTERN PRECIPITATION CORP.
1016 W. 9th St., Los Angeles

Editorial ★ ★ ★

Huge Foreign Demand for American Paper

▶▶▶ THE REPORT OF THE Department of Commerce of the United States of the Import-Export business of the American Paper and Pulp Industry for the first seven months of this year as well as for the month of July disclose the reason why the paper industry is in a strong basic position. For the seven months, the exports of paper and pulp were 644,282 tons. Paper exports show an increase of 158 per cent over the same period in 1939. Pulp exports for July show an increase of 581 per cent over the exports for July, 1939. The total exports of both pulp and paper are equivalent to the total production of more than ten mills producing 200 tons a day for 310 days in the year.

Now, this immense volume of new paper and pulp custom is coming from consumers outside the United States and is an increase on top of the increased volume of paper and pulp consumption in our own country.

Another significant thing which the Foreign Commerce report shows is that the demand from foreign sources is increasing in volume and in price. For instance, the average monthly export of paper and pulp for the first seven months of 1940 were 92,040 tons—the exports for July were 135,267 tons. The average price at which the seven months paper exports were shipped was $103.11 per ton. The average price in July was $106.55 per ton—an uptrend of $3.44 per ton.

The average price for pulp export for seven months was $58.73 per ton. The price for July was $66.15 per ton, showing an uptrend of $7.42 per ton. Still another very significant fact is that the average price of all export paper in July was $5.327 per cwt., while the average price of all sulphate papers for domestic markets was approximately $4.25 per cwt. The reason we use sulphate papers for comparison is because of the large volume tonnage in that division. The fact we desire to emphasize is that our domestic paper is being sold to American consumers at substantially less than the export customers' price.

The effect has been the adding of vast numbers of new customers for American papers. This new custom has come and the longer the war lasts, the greater the percentage of them will remain permanent users of American paper products. All of this big shift in demand and supply of paper and pulp industry has come about as a result of the war. The paper and pulp supplies that formerly came from the Baltic Sea area are denied to the world at large today. However, European countries are taking all that Sweden and Finland can produce. Europe must have cellulose. It is the only source of supply for cellulose fiber available to them. Europe can get no cotton. They must have Scandinavian fiber as substitute.

Hence, India, Africa, South America, Australia, New Zealand and Asia must look to this country for the supplies of paper, particularly those grades they procured formerly from the Baltic Sea area.

It now seems certain that England has defeated the threat of German invasion this fall. The hostilities will go on into next year and how much longer nobody knows. However, the longer it lasts, the larger will grow the demand from foreign sources for American paper and pulp.

The American paper and pulp industry is well aware of all these facts and contingencies. It is doing a fine job of measuring up to their problems.

America's Future

▶▶▶ "MAKE AMERICA STRONG" was the keynote of the Eighteenth Annual Conference and Exposition of the National Industrial Advertisers Association held recently in Detroit. So potent is this thought to present world conditions that it has been used as the subject of the Theme Page of this issue.

Meditating further on the theme brings to mind, like a moving fantasy or apparition, the landing of the Pilgrims, the wresting of land from the wilderness, further settlements along the Atlantic Seaboard, the Revolutionary War, the development of transportation and of industry, the Civil War, development of the Middle West and the Pacific Coast, the World War No. 1, the business depression which began in 1929 and its effect upon the lives of the American people, or, all in all, a panorama of some of the highlights of this country's history—its struggles and achievements.

America today is the result of this past. It is the record of accomplishment, based on the idealism, fortitude and vision of its leaders—those who have gone before and those who are now contributing to making this country a better place in which to live.

What the future of America will be depends upon the present and future attitudes of its people more than on any physical attributes it may possess.

If progress of an individual may be used to personify progress of America, then the words of J. F. Clarke, 19th Century clergyman and theological writer, excellently typify this progress. Here are his words:

"Progress, in the sense of acquisition, is something; but progress in the sense of being, is a great deal more. To grow higher, deeper, wider, as the years go on; to conquer difficulties, and acquire more and more power; to feel all one's faculties unfolding, and truth descending into the soul—this makes life worth living."

May America continue to be strong—and a good country in which to live.

ADVERTISING PAGES REMOVED

CURRENT THOUGHT

A LITTLE SERMON ON ADVERTISING

WILLIAM SIBLEY

▸▸▸ THE SUDDEN INCREASE in preparedness for war has presented serious problems to many companies. Some are already engaged in capacity production and, consequently, are faced with the problem of holding and developing normal markets. Others face the shortage of skilled labor and raw materials. The growing tax burden is a universal problem.

Perhaps the most comparable period in American history, for us, is the years immediately preceding and during the World War I. A review of the trends of business and advertising at that time, therefore, might well be in order. The World War began in 1914—a year in which magazine advertising expenditures totalled about 20 millions of dollars. By the time we got into the fracas (1917) magazine advertising expenditures were totalling over 40 millions. By 1920, they were 110 millions. Following a comparative brief slump for the post-war period of adjustment this level of expenditures continued through 1924 and 1925, when they began to skyrocket through 1929, into 1930.

According to compilations made by the Curtis Publishing Company, the percentage of increase in volume of magazine advertising, between 1914 and 1920, for given products is as follows: Furniture and floor covering, 1,622 per cent; Structural, 1,288 per cent; Metals, 1,080 per cent; Paper and transparent wrappings, 1,050 per cent; House furnishings and equipment, 850 per cent. The average of all advertised products was 475 per cent.

Why should war so stimulate both industrial and consumer advertising—? Why should a company, whose plant facilities have been commandeered by the government for the production of war implements, continue to advertise—when it isn't possible for them to accept orders from former normal customers—? Before attempting to answer, however briefly, those questions, let us consider some of the basic fundamentals a war always visits upon industry.

According to the Department of Commerce, the national income for 1940 will be more than 90 billions of dollars, which compares with the 70 billions of 1939. American business has already felt the stimuli of Allied war purchases. To this presently will be added our own governmental purchases. With the billions of dollars being poured into the construction of destructive machinery, we must also add relief, farm parity payments and many other governmental expenditures. The force of this can only mean re-employment, increased wages, two and three-shift working days, overtime pay—all of which combine to increase the flow of money into consumers' hands, which creates new demands for consumer goods. To meet these demands we must be prepared to face serious adjustments. Ordinary business relationships will doubtless be disturbed by problems of plant production, distribution and transportation, priority schedules, new taxes and further government regulation. To hold the normal mass market while operating at plant capacity to fill temporary emergency orders will require both skill and good management.

During this shift from a buyer's to a seller's market, advertising can play an important role. Advertising can promote better relationship between management and labor. It can create public (or industrial) acceptance for a company's efforts as well as its products. Advertising may be used to strengthen dealer set-ups. During a period of rapid changes telescoped into an emergency you can refuse orders from dealers whose credit or policy toward your product was not good during normal times—then use advertising to foster and develop worthwhile relationships with good dealers even though their orders cannot immediately be filled. Advertising will maintain morale with the trade. It will help educate new dealers who spring up in good times, a large portion of which remain in business after the termination of the emergency. Through advertising you can gain good will by announcing the fact that you are doing everything in your power to keep down price increases. Such advertising promotes confidence in your business management and prepares the way for acceptance, when price increases finally do become necessary.

Our birth and growth rates make millions of people enter the market every year. This factor now has added to it the fact that of even greater importance that with re-employment many more millions will be re-entering the market which has been closed to them during the past ten years. The company that reduces or ceases its advertising during a period of capacity production rapidly loses control of its basic market. Emergency contracts always have an end, and when that end comes the non-advertiser might readily find competition well entrenched at the time when it is becoming increasingly difficult to sell goods.

The heavy impact of rapidly repeated history-making events may (but should not) have a depressing effect on business. The uncertainty of the future may (but should not) cause companies to be extra-cautious toward commitments of funds. The sales and advertising forces may be cut—just at the time when they are most needed—because advertising is a stabilizing force. It helps overcome doubts in the purchaser's mind about the desirability of buying a product. A decrease in advertising helps promote the very situation the company seeks to avoid. Advertising is an insurance against the uncertainty of the future.

Every market is dynamic. The membership of any market is constantly changing. In every market the membership's attention is constantly being diverted by new products, news announcements, sales messages. It possesses a short memory and needs constantly to be reminded. And it also possesses mass inertia which makes it easier for an advertiser to hold an established market than to re-invade it after he has lost it.

Brown Mechanical Pulp
from Yellow Birch

An abstract of a thesis submitted in partial fulfillment of the requirements of the New York State College of Forestry, Syracuse, New York, for the degree of Master of Science in 1938. Literature citations of work done after that date are not included.

MYRON KIN[1] and C. E. LIBBY[2]

LITERATURE

▶▶▶ THERE ARE SEVERAL patented processes in existence which consist of pretreating wood in preparation for grinding. Probably the best known are the Enge (*12*) process which advocates the addition of a neutral acid or an alkaline reagent to the water used in pretreating the logs and also the use of sulphite acid before and after steaming; and the C. W. Wiig (*12*) process which proposes that blocks of wood be impregnated with sulphur dioxide gas in a digester exhausted of air and then cooked in a solution of sodium chloride (NaCl). C. G. Schwalbe (*12*) prepared a white groundwood pulp from steamed or boiled wood by excluding air and introducing reducing agents such as sulphites, bisulphites, and sodium sulphide and then subjecting the wood to a vacuum, starting with air-free steam, and digesting with hot water, and finally grinding. C. J. Jansson (*12*) found that by keeping the cooker at least two-thirds full with water and the pressure at or below two atmospheres and cooking for 18 to 20 hours, a bright pulp could be obtained. A. Zacharias (*18*) made brown pulp by subjecting the wood with the bark and bast to the action of steam, then removing the bark with brushes and cleaning the fiber.

Chemicals with reducing properties were used in all of the above processes to retard the darkening of the wood. Exclusion of air also aided in the prevention of any oxidation that might take place.

BOILING OF WOOD

Wood is known to be inert to water, but when both are in contact at high temperatures and under pressure, chemical and physical reactions take place. Schorger (*14*) found that wood when treated with water becomes soft and pliable, and at high temperatures partial hydrolysis occurs. Parts of the wood are soluble in water. Tauss (*14*) found at five atmospheres pressure (153 deg. C.) maximum solubility is reached. Both Zacharias (*18*) and Schorger (*14*) declare that wood loses up to four per cent extractives by the boiling process. The main constituents of wood are cellulose, the hemicelluloses, and lignin. Cellulose is more inert chemically than lignin. Potter (*10*) in his work showed that treating wood with water at 100-120 deg. C. caused partial delignification of the wood.

Constituents of wood other than cellulose such as hemicelluloses, tannins, fats, gums, resins, pentosans, and lignin hydrolyze and decompose into a diversified number of products. Tauss (*2*), Zacharias (*2*), and Franck (*2*) have analyzed the extract from boiling wood and found reducing sugars, furfural, volatile acids, and methyl alcohol.

Aronovsky and Gortner (*2*) have studied the effect of water in the cooking of wood and have helped in throwing light on this unknown field. Since it was known that volatile acids, especially acetic, were found during the cooking process, it was thought that these acids had quite an important part in the destruction of wood and the formation of furfural. Aronovsky and Gortner, however, proved quite definitely by their work that water alone resulted in the destruction of the wood and the formation of furfural.

STEAMING OF WOOD

Another method of treating wood before grinding is the process of steaming. Thickens (*16*) found that there was no appreciable difference in the strength of the resulting pulp whether the wood was boiled or steamed. However, Thickens in the same work stated that steaming was preferred since the condensed liquors can be drained off in concentrated form, making it very adaptable for a study of by-products. Bragg (*3*) also thought that the steaming method is preferred since it is more practical, for the heat is given up directly to the logs, and exhaust steam can be reclaimed by blowing off to the boiler room. Any chemical added as the reducing agent, and which becomes or remains in the gaseous form at high temperatures can also be recovered.

Zacharias (*18*) in his studies of steaming and boiling found that steaming caused wood to lose weight and volume, due to loss of water by imbibition, whereas wood in boiling increased in volume. However, this loss of volume in steaming depends on the density of the wood. The denser the wood the less water of imbibition is lost, and also the less power required for grinding.

Treating wood by either steaming or boiling has been found to lossen the bonding between tracheids, especially so in the summer wood and more so in boiling than in steaming. Bragg (*3*) agreed with Zacharias (*18*) and Schorger (*14*) that fibers are loosened, and he believed that this resulted in a strong pulp for the fibers were rubbed off in their entirety with some fibrillation instead of being cut off in bundles and reduced to flour and short, brashy, weak fiber particles.

Both Schorger (*14*) and Zacharias (*18*) found that steaming removed from 0.1 to 0.2 per cent incrusting material from the wood. Thickens (*16*), however, steamed two-foot bolts of wood and found they lost 5-8 per cent as volatile materials and water-soluble substances.

Both Zacharias (*18*) and Schorger (*14*) analyzed the condensed liquor extract from their steaming experiments. Schorger, after steaming for eight hours at four atmospheres, found sugars, resin, tannin, furfural, salts, and organic acids. Zacharias, however, found in addition, amines, acetone, methyl alcohol, methyl-furfural, and humus substance. He also found that steaming wood tended to concentrate the inorganic salts toward the interior of the pieces of wood and to cause the resins and waxes to impregnate the walls of the cells.

(1) Research chemist, Cellulose Products Division, Dow Chemical Company, Midland, Michigan.
(2) Professor of Pulp and Paper Manufacture, New York State College of Forestry, Syracuse, New York.

Thickens (*16*) found that pulp from steamed wood was dark in color, the depth of color depending on the temperature and pressure of steaming. At the lower pressures, there was not much difference in the effect of steaming and boiling.

FURFURAL

Heuser (*6*) stated that furfural was doubtlessly formed by the action of organic acids and steam on the pentosans of wood. After steaming wood for some hours, Heuser found considerable quantities of furfural. Schorger (*14*) found that wood had to be steamed for eight hours before furfural could be detected.

The analytical data of Ritter and Fleck (*11*) show that hardwoods have about 50 per cent more pentosans than conifers, and therefore more furfural would form upon hydrolysis.

A much more comprehensive treatment of the hemicelluloses is given by Norman (*9*).

VOLATILE ACIDS

Schorger (*14*) on heating wood with water under pressure produced acetic acid, formic acid and methyl alcohol. Schorger (*15*) was not certain, however, that all the acetic acid was formed by hydrolysis of the acetyl (CH_3CO) groups, but some might have come from the residue (CH_2CO). Hawley and Wiertelak (*5*) concluded that the acetic acid resulted from the hydrolysis of the pentosans, for they discovered that acetic acid by hydrolysis in hardwoods decreased with heat treatment and increased when softwoods were treated. Kressman (*8*) believed that the source of the volatile acids was the hydrolysis of the acetyl and formyl groups present in the lignin complex. Bergstrom (*8*) found that he obtained large increases in formic acid yields when he increased the pressure, time of cooking, and the concentration of any acid catalyst. He thought that this increase was probably due to the decomposition of sugar.

Schorger (*15*) obtained from yellow birch volatile acids amounting to four per cent calculated as acetic acid. After heating on a steam bath with mercuric oxide (HgO) to destroy the formic acid, 3.6 per cent of acid was recovered. The formic acid probably resulted from a decomposition of the carbohydrates and not from formyl (HCO) groups.

Bergstrom (*14*) after treating birch for two hours at six atmospheres obtained 3.13 per cent acetic acid and 0.16 per cent formic acid. Under the same conditions, he obtained from spruce 1.53 per cent acetic acid and 0.23 per cent formic acid. Heuser (*6*) in steaming wood found that organic acids (acetic and formic) formed early to the extent of 0.213 per cent and 0.032 per cent respectively on the weight of the wood, and that the amounts increased steadily as steaming continued.

Hawley and Wiertelak (*5*) made an interesting discovery on their treatment of wood. They found that heating wood decreases the carbohydrate components and increases the component that would be determined as "lignin." The isolated lignin from the heated samples was slightly different than that from the unheated sample. They believed that some of the carbohydrates of wood had been transformed into a compound similar to lignin.

TANNIN

The presence of tannins in the liquor extract as detected by Schorger (*14*) and Thickens and McNaughton (*16*) might lead one to believe that they might possibly play some part in the coloring of the treated wood. Holzer (*7*) studied the reactions of tannin products in pine kraft pulps. He found that acids and reducing agents lighten the color of phlobatannins, but these phlobatannins reoxidize in the presence of air. Allen (*1*) states that natural tannins have a marked tendency to absorb oxygen, resulting in strongly colored products.

EFFECT OF PRETREATMENT ON GRINDING QUALITIES OF WOOD

Cline and Thickens (*4*) concluded from their work that steamed wood consumed more horsepower per ton than untreated wood, and that hardwoods consumed less horsepower per ton than conifers. They also concluded that steamed wood yielded stronger pulp, but of poorer color.

Thickens and McNaughton (*16*) found that when wood was steamed prior to grinding, a strong pulp could be obtained at lower horse-power consumption on the coarse grit stone than on a finer one. The horsepower consumption per ton increased directly as the length of steaming and the steam pressure employed. The strength of pulp was found to increase with increasing power consumption per ton.

Schafer, Pew, and Heinig (*13*) in their recent work on grinding both treated and untreated "swamp" black gum (*Nyssa biflora* Walt.) found that using a dull stone and high grinding pressure resulted in highly fibrillated pulps of fair strength. Treating the black gum above 100 deg. C. gave a poorly colored pulp, but resulted in longer fibers. They found that wood treated at 170 deg. C. was dark brown in color and long fibered, but had lower strength than commercial newsprint pulp. They tested 29 different North American Newsprint ground wood samples and reported the average strength characteristics as follows:

Ream Weight—24x36—500—100 pound sheet
Bursting—0.22 points per pound ream
Tearing—0.68 grams per pound ream
Breaking Length—1780 Meters

They found also that treated wood consumed a lower power consumption per ton than untreated wood. The papers made from this pulp had, however, an undesirable roughness of surface.

Literature Cited

1) Allen. *Commercial Organic Analysis,* 5th ed. Vol. V, page 1.
2) Aronovsky. Gortner, and Aiken: *Ind. Eng. Chem.* 22 (1930), page 264.
3) Bragg. *Chem. Met. Eng.* 27 793-7 (Oct. 18, 1922).
4) Cline and Thickens. *Applied Chemistry,* 83-99.
5) Hawley and Wiertelak. *Ind. Eng. Chem.* 23 184 (Feb., 1931).
6) Heuser. *Papier Ztg.* 39 1280-1 (through chem. abstracts).
7) Holzer. *Tech. Assoc. Papers* (1935) pages 517-29.
8) Kressman. U.S.D.A. Bulletin No. 983.
9) Norman. Biochemistry of cellulose, the polyuronides, lignin, etc. (1937).
10) Potter. Ann. Botany 18 121 (1904); and Spaulding 17th Annual Report of Miss. Botanical Garden page 41 (1906).
11) Ritter and Fleck. *J. Ind. Eng. Chem.* 14, 11 (Nov., 1922).
12) Rue. *Paper Trade J.* 81, page 16 (Oct. 15, 1925).
13) Schafer, Pew, and Heinig. Unpublished data from Forest Products Laboratory (private communication to the authors).
14) Schorger. *The Chemistry of Cellulose and Wood.*
15) Schorger. *J. Ind. Eng. Chem.* 9, page 6 (June, 1917).
16) Thickens and McNaughton. U.S.D.A. Bulletin No. 343 (April 26, 1916).
17) Wilson. *The Chemistry of Leather Manufacture* 2nd ed. Vol. I, page 416.
18) Zacharias. *J. Soc. Chem. Ind.* 31, page 582 (1912).

This article is in three parts. Parts II and III will be published in successive issues of this magazine. *Editor's Note.*

HEAT and POWER in the Pulp Industry

MAX F. A. WULFINGHOFF
Mechanical and Chemical Engineer

▶▶▶ THE PROBLEM OF ESTABLISHING both a satisfactory heat balance and a reasonable material balance in the pulp industry has given, and continues to give, much work to both mechanical and chemical engineers, owing to the fact that energy is used, and can be recovered, at a number of process operations, and by very divers means.

As a general thing, the basic operations involved are the disintegration of the original fibrous raw materials, the modification of the properties of the fibers to suit their particular use requirements, and a redistribution of the fibers to obtain a suitable shape, eventually by subsequent pressing and drying, or else by chemical reactions, as in the case of rayon. Considerable mechanical, thermal and chemical equipment is required, among which usually wood grinders or chippers stand out as the main power consumers, and digesters as the principal heat users, their share in the total load depending largely on the type of pulp manufactured, whether mechanical, semichemical or chemical.

Since the saturation temperature of steam is a function of its pressure, different pressure ranges are often desirable, as 5-10 lb. per sq. in. for general heating and bleaching, 30-40 lb. for drying, 100-120 lb. for cooking, together with the most economical pressure for power generation. This situation leads to the adoption of back pressure or bleeder operation. However, digesters cause noticeable swings in process steam demand. So thermal storage also enters the picture, and has proved successful as a contribution towards balanced operation.

Tables 1-3 give a general idea of figures likely to be encountered in heat and energy balances, for the purpose of rough estimates. No fast rules can be given, since each mill is an individual affair.

Steam Generation

Comparatively high initial pressures are favored by the relatively large size of the mills, and by the circumstance that they work 24 hours per day. Steam producer types vary according to output, kind of fuel, quality of feed and initial steam conditions which in turn depend on power requirements. Safety margins are necessary in case of appreciable distances between departments, and of mixed or wet fuels.

Over-all boiler efficiencies of 83-89 per cent are obtained with coal or oil; wood with 45 per cent moisture in combination with natural gas yields 70-72 per cent. With evaporation rates of 5-15 lb. per sq. ft., final gas temperatures are 240-400 deg. Fahr., with 8-14 per cent carbon dioxide. Depending on the fuel, heat release in combustion chambers amounts to 12,000-40,000 B.t.u.'s per cu. ft. Boilers should be simple in design and reliable, and combine satisfactory efficiency with moderate investment. They are usually of the natural circulation, convection or radiant type, have one to three drums, and may be equipped with economizers and air heaters. Rated outputs of average units are between 70,000 and 120,000 lb. of steam per hr. Electric boilers become attractive where the energy supply is sufficiently steady and cheap, as in regions enjoying hydroelectric resources, especially for supplying cooking and drying steam. They are available for pressures up to 425 lb. in units of 2,000-15,000 kw.

In fuel-fired boilers a wide variation in firing systems exists, according to the more or less urgent necessity for disposing of waste or by-products.

Types of Fuels

Exclusive wood firing occurs in the vicinity of some primeval forests, as in Brazil, Finland, etc. Heavy plane grates resting on a substantial steel structure, and accessible through an ample number of firing doors, have been used for handling logs up to 2 ft. in diameter and 7 ft. in length. If economically possible, however, some fuel higher in calorific value is added; combination firing systems may comprise a main furnace designed to burn gas, oil or pulverized coal, and an auxiliary furnace handling bark, waste or mill refuse.

If wood and coal are burned on horizontal grates, the wood is preferably charged on top of the coal layer. In auxiliary woodburning furnaces, grates featuring one upper and one lower level, with an incline in between, offer the advantage of automatic continuous operation and even fuel distribution.

Since pulpwood bark may contain as much as 70 per cent of moisture, and in most cases the kind of wood burned has only a comparatively low heating value due to low resin content, as a rule no water-cooling is provided in auxiliary furnaces. Heat liberation from additional firing systems, however, may enforce the use of a certain amount of cooling surface to protect the refractory. Pulverized fuel burners may be located opposite the wood burning grates, or else tangential corner firing may be used (Figure 1). Combination oil and gas burners are often accommodated in the front wall.

Adequate distribution of combustion air is important. Suitably arranged nozzles under appropriate angles maintain a satisfactory degree of turbulence, and lanes of orifices in the floor of main furnaces ensure that any particles carried over from auxiliary furnaces burn out. Preheated air has in some instances been used both in main and in auxiliary furnaces. A sufficient number of easily accessible, deep ash and soot hoppers should be provided.

Black liquor contains about 14 million B.t.u.'s per ton of pulp or about 5,000 B.t.u.'s per lb. of solid matter. To eliminate the undesirable water content as far as possible, the liquor may be sprayed into a flue gas duct where its density can be increased from, say, 1.08 to 1.1, which latter figure corresponds to about 14 per cent of solids, including a slight percentage of substances absorbed from the flue gases. Further thickening in evaporators yields a thick slurry of a specific weight of 1.2 or better, and containing about 57 per cent of solids. This is either calcined in rotary furnaces, or blown in a coarse spray into the combustion chamber of a boiler, by means of oscillating nozzles. It adheres to the furnace walls, dries up, breaks off and falls on a hearth where it burns out. The chamber has to be lined with

chemically neutral refractory, and water-cooled. Preheated air is introduced near the furnace bottom, while secondary air is admitted above the spray. This mode of operation permits the recovery, by means of leaching, of chemicals from the charred substance. Several units of this type generate steam of about 450 lb. per sq. in. For furnaces of this kind a recovery of 90 per cent of the heat in the black liquor is claimed.

The evaporators for thickening black liquor work continuously; the final slurry is removed from under 20-25 in. of vacuum; four to five effects are usual.

In some places, the use of imported elemental sulphur for making sulphur dioxide for use in the production of sulphite cooking acid has been replaced by locally available pyrites (usually flotation concentrates) which may be treated either in roasters of the Herreshoff, Wedge or Lurgi type, or broken up in ball mills, and blown through burners into the upper part of a flash roaster. A temperature of about 2100 deg. Fahr. must be maintained, to prevent formation of trioxide, and gases must be cooled rapidly to a temperature compatible with scrubber and absorption tower operation. Therefore, a secondary combustion chamber follows behind the primary one, which contains steam generating elements encased in corrosion resistant sheathing. Fans handling sulphur gases are lead-lined, or made of ceramic materials. Roasted ore is a by-product of this process. Pyrite firing may yield 1 lb. of steam (Figure 2) at 200 lb. pressure per pound of concentrate; gases usually contain 12 to 14 per cent of sulphur dioxide. Traces of arsenic or selenium in roaster gases can be caught by electrostatic precipitators of the Cottrell type.

In other cases, the boiler itself may become part of the chemical equipment by supplying carbon dioxide for making carbonates, steam being a by-product. In Europe, LaMont coil systems have successfully been employed in soda furnaces, utilizing waste heat to an extent sufficient to cover the basic steam load.

Prime Movers

Due to the rather large size of modern pulp mills complete electrification will be considered in most cases. Particularly, where the power load is considerable, as in the case of an extensive use of grinders, the unit output of which may be of the order of 1200 hp., it may exceed the heating load. In that case as much of the power as possible should be obtained at the low steam rate of a main turbine.

Table 1—Typical Pressure Ranges, lb. per sq. in.

Prime movers	Up to 2000, usually 400-600
Boiler room auxiliaries	In high pressure plants, below pressure of prime movers, otherwise pressure of prime movers.
Digesters	50-150
Paper machine dryers	30-45
Evaporators	40
Chemical equipment	5-40
Coating mill dryers	10
Bleaching	10
General heating	5

In other cases, individual drives either by turbines or by reciprocating steam engines are encountered. Geared backpressure turbo sets are common up to 5000 hp., condensing units up to 2500 hp., with initial steam temperatures up to 1000 deg. Fahr. and speeds of 6000-9000 r.p.m. Direct coupled units run mostly at 3000 r.p.m. due to electrical requirements. Reciprocating steam engines, with which the initial steam temperature is limited to about 750 deg. Fahr. are usually up to 700 hp., and have been built up to 6000 hp. It can be shown that, with, say 60 lb. backpressure, reciprocating steam engines would still be economical in 2000 hp. units for 300 lb. initial pressure, in 3000 hp. units for 375 lb. initial pressure, etc.

Large paper mills in industrially developed regions are sometimes equipped with one variable voltage d-c. set for each paper machine driven by a backpressure steam turbine exhausting to dryers, and to which is also coupled a synchronous a-c. machine connected to a hydroelectric system. This arrangement is extremely flexible. Under ordinary conditions the backpressure turbine operates at a load corresponding to the average power required. During water shortages, the tubine can deliver energy to the hydroelectric network via the synchronous unit. If for some reason the turbine must be shut down, it is uncoupled, and the synchronous machine runs as a motor. For starting, an auto-transformer is provided. Drying steam may be obtained from an electric standby boiler or from some other source. Mills running mainly on hydroelectric power may supply power as a by-product from process steam to a hydro-network. Cooperation of this kind warrants high over-all economy, but contracts between public utilities and industrial organizations regarding an exchange of power and heat are likely to become very intricate. However, this type of parallel operation is not uncommon.

Where power and heat supply are centralized, prime movers may be of either the backpressure, combined backpressure and condensation or of the extraction type. Simplicity of operation and warranted investment are factors affecting the selection. Backpressure commonly amounts to 15-120 lb. per sq. in. with extraction controlled. Another arrangement features one controlled and one free extraction point for digester steam.

In Europe, geared turbines with a clutch-connected electromotor as standby are popular for grinder and chipper drives, as well as for pump operation, due to their favorable steam rate. An interesting example is given by a mill in Rumania (Figure 3). In this pulp mill combined with a paper mill, several old power units were replaced. Finally, two boilers operating at 185 lb. and one 1500 kw. bleeder turbine

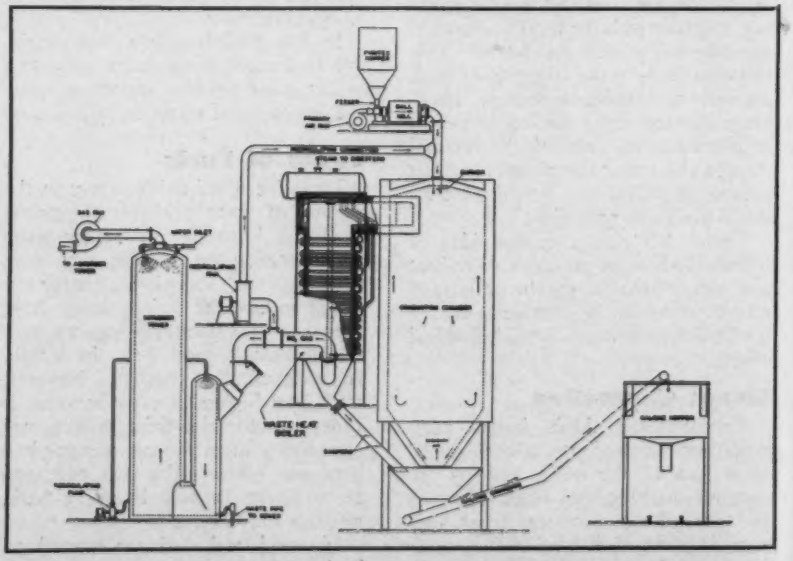


Fig. 1—General arrangement of waste heat boiler and pyrites flash roaster used to produce sulphur dioxide for sulphite process. (Courtesy Foster Wheeler Corp.)

remained. In 1925, this setup was extended by adding two B&W type boilers and one 1600 kw. bleeder turbine supplying steam at 28.5 lb. Later, a third boiler was installed like the two previous ones for 455 lb. The total output of these three boilers was 56,000 lb. of steam per hour. Then, a new plant was erected at a distance of 1000 ft. from the old one, featuring a 4500-kw. turbine of which the live steam and extraction lines were hooked up to the old plant.

The new turbine received steam at two different pressures 455 and 170 lb. The condensate from the turbine and paper machine in the new plant was returned to the old plant, the old turbines serving as standby units. The new turbine actuates a three-phase alternator and three wood grinders via gearing. Further increase of energy demand caused, in 1935, the addition of an oil-fired radiant boiler for 1710 lb. per sq. in. operating pressure and 890 deg. Fahr. steam temperature with an output of 60,000-80,000 lb. per hr., and of a topping turbine. The exhaust from the latter passes to a reheater which steps up its temperature from about 600 to 800 deg. Fahr. A steam cooler controlled by the final reheat temperature keeps the steam inlet temperature constant at all load conditions. Makeup water is provided from a quadruple evaporator. The over-all thermal economy in this case was increased to reduce the specific fuel consumption by 25 per cent.

Below 500 kw., appropriately designed reciprocating steam engines show better steam rates than turbines in practically any case. Where close speed control is required, oil-hydraulic devices have been developed which regulate the number of revolutions accurately within a range of 1:10. Unusually heavy flywheels, weighing 6 to 10 times as much as ordinary flywheels are occasionally found in this industry, especially in paper-machine drives.

Thermal Storage

Horizontal or vertical steam accumulators of the Ruth's Variable-Pressure type, operating below boiler pressure, in connection with bleeder type prime movers can help a good deal in approaching optimum fuel economy and smooth operation. They are also useful in connection with either electric boilers or combinations of electric and fuel fired units up to storage pressures of 250 lb. per sq. in. The steam delivered is saturated and practically dry. Accumulator sizes are between 3,000 and 13,000 cu. ft. (capacity 0.4-0.55 kw-hr. per cu. ft. depending on pressure drop).

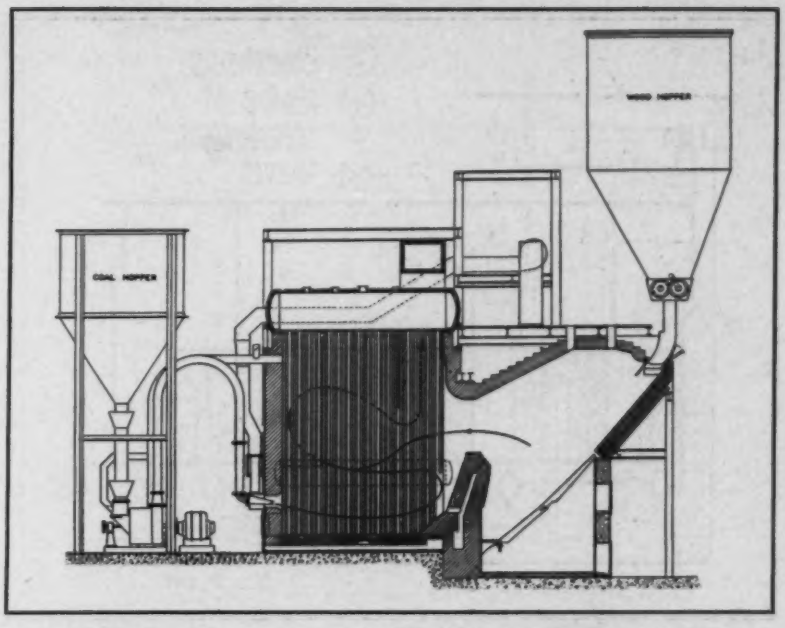


Fig. 2—Steam generating unit consisting of boiler with internal furnace fired by pulverized fuel and wood singly or in combination. (Courtesy Foster Wheeler Corp.)

Further heat savings are feasible by employing hot acid accumulators which take care of the gases and liquor vented off the digesters during cooking periods. Products thus stored are recycled or may be recovered. Where resinous woods are treated with alkalis, methyl mercaptans and other organic decomposition products characterized by an extremely bad smell are formed. Catching these products in pressure vessels for re-use or absorption has widened the possibilities of the sulphate process considerably.

Digesters

Indirect heating of digesters has been adopted almost universally, since it minimizes heat losses, prevents liquor dilution and thus reduces the expenditure of heat in concentrating black liquor, and cuts down makeup water requirements. Alkaline digesters are made of carbon steel plate, fusion welded and stress relieved. Sulphite digesters made of carbon steel require internal protection against acid action. Up to a few years ago, a double layer of acid-resisting brick laid in cement and finished with either a litharge-glycerol or a refractory-cement-waterglass compound was applied. This kind of lining has to be reconditioned occasionally. Recently, stainless steel digesters or digesters of alloy-clad steel plate with ⅛ in. cladding thickness have been introduced. Obviously, thermal coefficients of lining or cladding and steel must correspond as closely as possible. In checking operating stresses, the hydrostatic head of the digester contents and a certain corrosion allowance have to be considered. The average height-diameter ratio of digesters is between 1.5 and 3.5. Cooking pressure and duration depend on the nature of the process. Capacities of sulphite digesters are up to 12,000 cu. ft.; sulphate, up to 4,000 cu. ft. A complete digester system for indirect heating comprises the charging vessel, tubular heater, circulating pump and piping. Much thought is given to efficient mixing of liquor and charge, and to the development of devices assuring rapid charging and even packing of the batch.

Blowdown Recovery

Blowing down digesters to atmosphere from 100 lb. per sq. in. means a loss of about 2 million B.t.u.'s per ton of pulp, which can be avoided by the use of heater-condensers. After a cook is finished the pressure may be relieved by an overhead line, or by blowing down at full pressure. In the former case, the steam may pass through a cyclone separator to a condenser; the condensate is collected in a water tank. In the latter case, the steam may also be passed to either a surface or a jet condenser. The latter is preferable where carry-over of pulp is excessive. An average amount of pulp entrainment into tube bundles can be prevented by suitable design, with cleanout holes as a safety measure.

Combined indirect heating and blowdown recovery may save annually 25 per cent of the cost of the indirect circulating system, and an additional

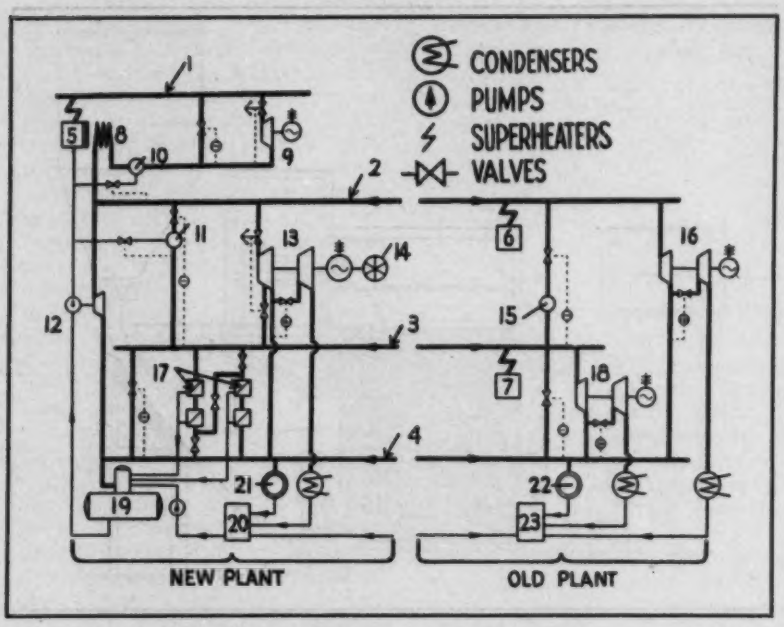


Fig. 3—Thermal hookup of paper mill in Rumania.

1—High pressure steam main, 1700 lb.—890 deg. Fahr.
2—Intermediate pressure steam main, 470 lb. —755 deg. Fahr.
3—Intermediate pressure steam main, 180 lb.
4—Low pressure steam main, 30 lb.
5—High pressure boiler with economizer, 1710 lb.
6—Intermediate pressure boiler, 455 lb.
7—Intermediate pressure boiler, 185 lb.
8—Reheater
9—Turbo-alternator set, 1000-1200 kw.
10—Desuperheater
11—Desuperheater
12—Boiler feed pump
13—Turbo-alternator set 4500 kw., also driving grinders (14)
15—Desuperheater
16—Turbo-alternator set 1600 kw.
17—Evaporator installation
18—Turbo-alternator set 1500 kw.
19—Deaerator and surge tank
20—Condensate tank
21—Dryers and general heating
22—Dryers and general heating
23—Condensate tank

Heavy lines—steam
Light lines—Feedwater and condensate
Broken lines—Impulse lines

6 per cent saving per annum is claimed due to reduced cost of feed conditioning, since the condensate from the liquor heaters is returned to the boilers.

Vapors and steam vented off digesters and liquor evaporators may yield appreciable quantities of turpentine, methanol and methyl sulphides, which can be recovered in special condensers. In the case of resinous woods, 1½-2 gal. of crude turpentine per ton of pulp have been obtained, so the corresponding equipment paid for itself within six months.

Heating Towers

Evaporation of hot water from wet products, and convection from open dryer cylinder and steam piping often heats the air in machine rooms to a temperature of 135-160 deg. Fahr. Most of the corresponding heat can be recovered, if the air with its average relative humidity of 75 per cent is blown to a heating tower the general construction of which resembles that of a cooling tower. Water is pumped to the top and distributed over the entire area, against the upflow of the air. It is heated to within 5-10 deg. of the wet bulb temperature of the machine room air, that is, by 30-40 deg. for air of 150 deg. Fahr. The water is collected in a hotwell. The heat transfer depends on the rate at which air and water come into contact; in mechanical draft towers it is 3-4 times as high as in natural draft types of identical ground area. Fan power and entrainment out of the tower limit the air velocity.

Miscellaneous Heat Exchanging Equipment

The danger of clogging passages is always present with the handling of fibrous substances, and forms a deciding factor in the selection of heat exchangers. Vacuum flash chambers, combined with heater-condensers, can handle even heavy pulp suspensions. Where dilution is sufficient, tubular heaters are preferable for large throughputs and small temperature differences; while small throughputs with comparatively large heating capacities are satisfactorily maintained at pressures not exceeding 170 lb. per sq. in. in spiral type exchangers. Where heat is exchanged over a short distance, only a limited number of tubes and bends is required. Tubes are usually expanded into tube sheets. Temperature stresses are taken up by expansion joints, or else fixed bottom tube sheets are combined with packed floating heads, as in the case of cast shells. Tubes and tube sheets may be made of carbon steel, copper, brass, nickel or, as in the case of liquor heaters, of stainless steel. To prevent contamination, especially where boiler feed is preheated by chemical solutions, double tube sheets are often employed. Incrustations in tubular exchangers can be reduced by a sufficient velocity of circulation.

Spiral-type heaters avoid the multiple passes which in tubular heaters for the same duty would bring about high pressure losses and considerable chance for incrustation in dead corners. A spiral exchanger consists of two sheets of plate wrapped around a center core and kept at suitable distance from each other, thus forming volute shaped channels. A partition in the central space forms two chambers into which the channels end. Inlet and outlet of the spiral are connected by separate headers; the lateral openings of the passages are closed either by sleeve packings, or by flat gaskets, or by welding up one or both ends at alternate sides. All passages can be cleaned by a water spray or sand blast; therefore, this type will handle spent liquor, flash vapors and the like.

Table 2—Average Steam Throughput, lb. per kw-hr.

Backpressure turbines and engines	22-60[1]
Condensing turbines	12-30[2]
Condensing reciprocating steam engines	15-25[2]
Simplex or duplex steam pumps	150-200[3]

1) Depends mainly on ratio $\frac{\text{Initial pressure}}{\text{Backpressure}}$

2) High figures apply to small unit outputs and small heat drops, and vice versa

3) Usually non-condensing at low operating pressures

Approximate Heat and Energy Consumption Data

Mechanical pulp	700 kw-hr. per ton
Pulp cooking—	
Sulphate and soda	3.6-4 million B.t.u. per ton
Sulphite	4.2-6 million B.t.u. per ton
Paper drying	3500 B.t.u. per lb. (dry)
Dry sulphite cellulose	15.5-17 million B.t.u. plus 200 kw-hr. per ton

Some mills use a zinc chloride treatment for making insulating fibers. To recover the chloride, the wash water having a density of 1.1-1.2 is concentrated in double-effect vacuum evaporators up to a density of 1.9.

In the operation of evaporators and their preheaters, corrosion is rather marked; modern practice uses Monel tubing in soda black liquor and in zinc chloride equipment, while sulphate process liquor requires nickel-chromium alloys (18-8 chrome-nickel steel), due to the presence of sodium sulphide.

In the thickening of spent liquor, sometimes intense foaming interferes with evaporator operation. This foaming is caused by soapy compounds of fatty acids, the recovery of which yields tall oil which is purified by distillation and used in soapmaking and other fields. Treatment of saponified fats and resins, obtained from kraft sulphate black liquor, with sulphuric acid yields oleic, linolic, abietic and other fatty acids which are recovered in bubble towers preferably fabricated of stainless material. This process requires comparatively high temperatures, up to 700 deg. Fahr.

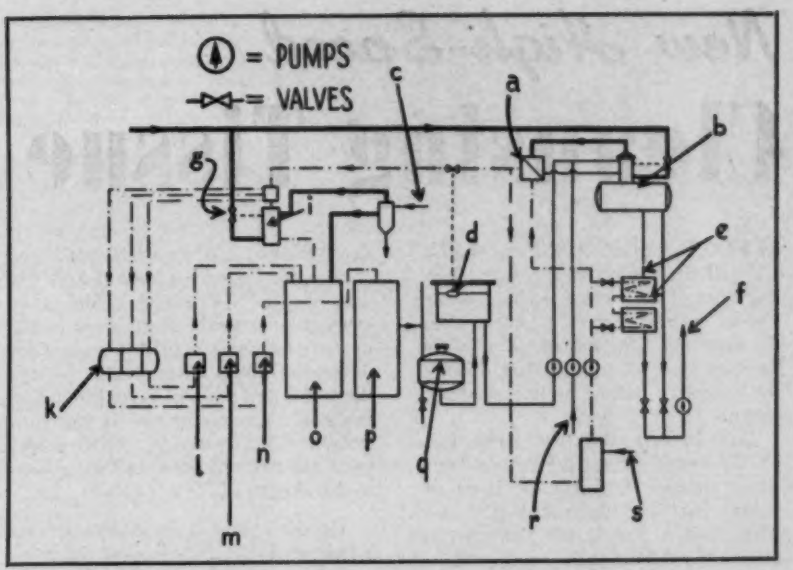


Fig. 4—Diagram of water treatment plant in Norwegian paper mill.

a—Vapor condenser
b—Deaerator and surge tank
c—Blowdown from boiler
d—Intermediary tank
e—Heat exchangers
f—Makeup to boiler
g—Temperature controller
i—Cascade type heater
k—Pressure tank
l—Sodium hydroxide treatment
m—Iron chloride treatment
n—Trisodiumphosphate treatment
o—First stage softener
p—Second stage softener
q—Gravel filter
r—Condensate from processing, etc.
s—Raw water supply

Heavy lines—Steam and vapor
Light lines—Condensate and makeup
Dash-dotted lines—Raw water
Broken lines—Impulse lines

Pumps

In this industry, pump duties may be unusually severe, due to several factors which may occur singly or combined:

1) Corrosion (as in pumping bleach liquors).
2) Abrasion (as in the case of mixtures of black liquor and salt cake fed to recovery furnaces).
3) Very high consistency of material handled (6 to 8 per cent pulp stock).
4) High temperature (liquor circulating in digester operation).

To withstand corrosion, a wide range of materials (Monel, nickel, iron, nickel-chromium alloys and ceramic products) are available, the selection depending on the individual case. Linings of natural rubber or some kind of synthetic rubber are often useful. Abrasion calls for extra-tough materials, and a use of enclosed, rather than open, impellers. High-consistency stock pumps are sometimes equipped with an additional propelling device (suction booster) to prevent dehydration, and vents to prevent air binding. Inspection covers should be easily removable; overhung type runners are generally preferred. The danger of choking diminishes with increasing physical dimensions. Pipe diameters below 3 in. should be avoided except for clear liquids. Casings should be split horizontally with both pipe connections on the lower half, so the runner can be removed without breaking any pipe flange packings. Ball bearings should be amply dimensioned and grease-lubricated. High-temperature pumps have water-cooled stuffing boxes. Operating speeds should be moderate in the case of pulp water, and as high as feasible in the case of clear liquids of ordinary viscosity.

Table 3—Winter vs. Summer Steam Demand

	Add to Summer Rate (approx. per cent)
Boiler feed pumps	20*
Feedwater heaters	20
Paper dryers	20
Beater water heating	120
Fan coils	150
General heating	320**
Condensation and radiation losses	20
General demand for low pressure steam	200
Prime movers	Practically no change

(*) Consumption of boiler and machine room auxiliaries may be assumed to approximate 5-10 per cent of boiler output expressed in kw.

(**) Average winter space heating steam equals about 20 per cent of total summer steam consumption.

Electrolysis

In the elimination of coloring matter and other impurities from chemical wood pulp, multistage bleaching processes using elemental chlorine in the first steps are employed increasingly. Chlorine may be obtained by electrolysis of potassium or sodium chloride. This electrolysis requires about 1.5 kw-hr. per lb. of chlorine, or, assuming an over-all efficiency of the converter set amounting to 87 per cent, approximately 1.73 kw-hr. at bus bars. To this requirement must be added another 10 per cent for handling and compressing the gas.

Treatment and Disposal of Waters

Purity of boiler feed is as important in this industry as in any other. Often special measures are required to obtain the necessary quality of water. In the case of a Norwegian mill (Figure 4), the raw water had moderate hardness but contained a high percentage of organic substance, mostly humic acids. The latter are now precipitated by

(*Concluded on page 683*)

New High-Speed
Cleansing Tissue Machine

▶▶▶ OCCUPYING APPROXIMATELY half the floor space of older paper machines of equivalent capacity, a new 134-in. machine recently installed in the Burnside, Connecticut, plant of the Sanitary Paper Company has doubled the concern's output of fine cleansing tissue.

Built by Rice, Barton & Fales, Inc., of Worcester, Massachusetts, the new paper machine combines the latest advances in both mechanical and electrical design and boasts the smallest electrical sectional paper machine drive (Reliance-Harland System) yet to be installed in the United States.

The motor-driven sections of the machine consist of (1) a couch section, (2) a press section (3) a dryer section and (4) a calender. An over-all linear speed range of 3½ to 1 is provided by a variable voltage control developed by the Reliance Electric & Engineering Company, Cleveland, Ohio.

The linear speed range of the calender section is sufficiently lower than the linear speeds of the other three sections to produce the desired degree of creping between the dryer and the calender.

Electrical Equipment

In its application of interlock regulators on the new paper machine, Reliance makes use of an alternator to impose a frequency proportional to the desired speed of operation of the paper machine on a small synchronous motor in each interlock regulator unit. One differential interlock regulator controls the couch and press sections simultaneously, while a second similar unit controls the calender section. All three sections are referred for speed regulation to the alternator.

The alternator is chain-driven from a front end shaft extension of the dryer section gearmotor, which is mounted directly above it. Gearmotor and interlock regulator for the press section are mounted on a fabricated bed plate resting on a concrete pier raised a few inches from the floor.

Under normal operation the gearmotors on the couch and the press operate from one controller. The rheostat in the interlock regulator controls simultaneously the fields of both motors. However, provision has been made for "inching" the couch motor when changing the fourdrinier wire. In this operation the top couch roll is raised, leaving the lower roll free to rotate without affecting the felt which travels through the press. The press motor is not operated when the couch motor is being "inched."

Mechanical Equipment

The paper machine itself incorporates the very latest improvements in design and arrangement of equipment.

The wire is supported on nine six-inch diameter brass table rolls.

Breast roll and wire rolls are dynamically balanced for operation at maximum speed.

The fourdrinier is equipped with automatic guides and stretcher. All outside wire rolls are equipped with Micarta doctors. The bottom couch roll has a centrifugally-cast gun metal shell while the top couch roll is made of light steel tube, and rubber-covered. Both upper and lower couch rolls are carried in anti-friction bearings and the upper bearings are mounted in swinging arms. Save-alls have been installed under the table rolls. Every effort has been made to keep the design of the fourdrinier section as simple as possible. It is not arranged to shake.

The press part of the new machine has been designed for use with a pick-up felt. An overhead framing supports the various felt rolls, felt stretchers, and automatic guide and wash box.

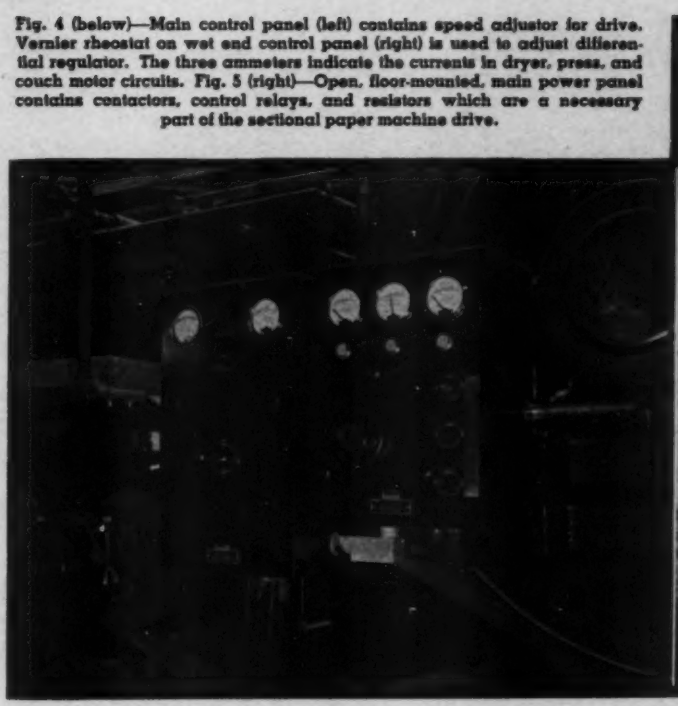
Lower roll of the first press is rubber-covered. The upper roll has a centrifugally-cast shell, is mounted in swinging arms, and makes use of a counterweight arrangement.

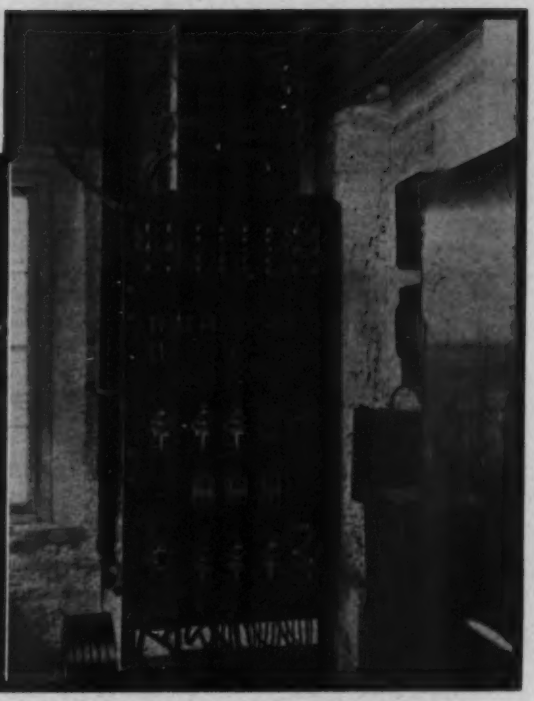
Fig. 1 (below)—The 15-hp., splashproof gearmotor in foreground is direct-connected to bottom couch roll of fourdrinier. A second splashproof unit, immediately behind the first, drives the bottom roll of main press. It is tied in with interlock regulator which controls simultaneously its speed and the speed of the couch motor.

Fig. 2 (below)—Looking down on calender section drive with interlock regulator in the immediate foreground. A mechanical drive with cone pulleys and flat belt ties together the calender intake shaft and the reel intake.

Fig. 3 (below)—Driven by the smallest electrical sectional paper mill drive yet to be installed in the U. S., this modern paper machine is turning out cleansing tissue in widths up to 128 in.

Fig. 4 (below)—Main control panel (left) contains speed adjustor for drive. Vernier rheostat on wet end control panel (right) is used to adjust differential regulator. The three ammeters indicate the currents in dryer, press, and couch motor circuits. Fig. 5 (right)—Open, floor-mounted, main power panel contains contactors, control relays, and resistors which are a necessary part of the sectional paper machine drive.





There are a pair of rubber-covered, squeeze rolls on the lower felt. Following this set of wringer rolls is a suction box ahead of the felt entering the first press and coming into contact with the paper.

The upper felt passes around the tail roll and then between the pressure roll and the dryer. The tail roll is mounted on the cross member under the dryer, and the pressure roll is located on this same arm. To obtain the proper pressure between the pressure roll and the dryer, this set of arms is moved in an upward direction, the force being supplied through air cylinders. Under all normal operating conditions this roll is kept in that position, but has been so designed that it can be swung down and away from contact with the dryer.

Mounted on the framework immediately above the pressure roll the dryer is equipped with a polishing and creping dryer doctor which oscillates. A hood directly over the dryer supplies warm air and exhausts the vapor to the atmosphere.

Immediately following the dryer is a three-roll calender stack, with lower two rolls equipped with steel doctors.

A uniform speed reel, which is next, has its cores mounted in two pairs of arms on a cast iron frame, one on each side of the cylinder. Operation of this reel is quite simple—when starting to wind up the paper on the reel core, it is allowed to come in contact with the cylinder, the paper passed around the core, and the roll started. When a roll of paper has grown to the required diameter, the paper is broken down and the second core goes into action. The full roll, carrying approximately 300 lb. of paper, is then removed from the reel by means of an overhead air hoist.

The flow box of the paper machine, designed by the plant's own operators, has been arranged to handle large volumes of water and stock at very low consistency, and is used in conjunction with a flexible lip sluice mounted over the wire.

Due to space limitations, the slitter and winder, together with the unwinder, have been placed at right angles to the paper machine. The unwinder consists of a cast iron frame having three stations, so that three sheets of paper may be unwound at the same time. Under normal conditions, however, two sheets are unwound and wound up into smaller rolls on the winder which consists of two drums and the requisite number of slitters for cutting the paper into the widths required in the finishing room adjacent.

HEAT and POWER

(*Continued from page* 681)

means of iron chloride, while the hardness is removed by sodium hydroxide and trisodiumphosphate. The water is degassed at a temperature of 212 deg. Fahr. and cooled to 140 deg. Fahr. in a heat exchanger. The low feed temperature and provision of an air heater permit intense cooling of the flue gases and a correspondingly high boiler efficiency.

The question of waste disposal is most pressing in the case of sulphite liquor. About 2000 gal. of spent liquor become available per ton of sulphite pulp. This liquor contains 1½-2 per cent of fermentable sugars which can be converted into alcohol and which in turn is recovered by distillation. The possibilities resulting from a low temperature carbonization of concentrated spent sulphite liquor are being investigated in Europe, with a view towards obtaining methanol, acetone, and other organic chemicals. The economy of all of these recovery methods is linked with the question of whether a suitable heat balance can be found to make ends meet.

Possibly the number of pressure stages involved in the preliminary operations of chemical pulp mills can be reduced, thus simplifying the heat balance as well as the piping system. The operating temperature of cylinder dryers, for instance, has in the case of several new installations in Russia been lowered from 160 to 105 deg. Fahr. by means of vacuum enclosures. This practice is said to have reduced heat losses and at the same time improved the quality of the final product. However, it seems that much more work is to be done before pulp mills can be laid out with the same degree of accurateness that is usual in the case of most central stations.

▶▶▶ THE SOUTH'S NEWEST pulp and paper mill has just been completed and is practically ready to go into production. This modern development is the latest achievement of Hollingsworth & Whitney Company. It is called Chickasaw Mills, and is located just four miles north of the City of Mobile, Alabama, on the west bank of the Mobile River.

The Chickasaw Mills are the result of painstaking study extending over a number of years, and typify the most up-to-date developments in paper-mill layout and construction. The unit includes pulp mill, pulp drying machine, bleach plant, fourdrinier machine and cylinder machine, and all necessary attendant equipment. The plant is designed to produce approximately 200 air-dry tons of sulphate pulp, both bleached and unbleached. The paper machine capacity is approximately 160 tons. The balance of the pulp will be dried for shipment.

Many factors combined to indicate the choice of Mobile as the site of the Chickasaw Mills. The city is one of the fastest growing industrial centers in the South. Splendid rail and shipping facilities are close at hand, and a plentiful supply of wood is readily available. The company has purchased woodlands within hauling distance of the mill.

The company has enjoyed a reputation for skill in papermaking, extending to the first half of the nineteenth century. A partnership was founded in 1862 by E. A. Hollingsworth, who had been engaged in the manufacture of paper at Braintree, Massachusetts, and L. Whitney, Jr., who had been manufacturing bags at Watertown, Massachusetts. Following the death of the partners, the business was incorporated in 1882. Paper production increased from less than 20 tons per day in 1882 to the present capacity of 450 tons per day. The company's Waterville (Maine) mill was built in 1891-1893.

The officers of Hollingsworth & Whitney Company are: M. L. Madden, president; W. B. Merlin, vice president; H. C. Thayer, treasurer; and Robert Nivison, manager of mills.

The operating executives of the Chickasaw Mills at Mobile are: D. E. Cousins, mill manager; William Nivison, assistant manager; V. C. Watters, superintendent of paper mill; R. F. Cuyle, superintendent of pulp mill; C. A. Redden, chief engineer; R. F. Erickson, plant engineer; F. B. Smith, power engineer; G. R. Dubus, master mechanic; Lawrence Bushell, chief electrician; E. M. Leavitt, chief chemist; R. F. Weston, chief forester; C. V. Riefenberg, office manager; H. G. Torbert, executive secretary; R. E. DeNeefe, Mobile traffic manager.

Hardy S. Ferguson Company of New York have been the consulting engineers, and Rust Engineering Company of Pittsburgh have been the general contractors. Fay, Spofford and Thorndike of Boston have designed certain of the administration buildings. Grinnell Company, Inc., of Providence supplied all production and sprinkler piping, and the air conditioning installation. The Allegheny Industrial Electrical Company did the electrical work.

It is planned to receive wood at the plant by truck, rail and barge. The wood yard is located at the north end of the mill where it may be reached conveniently by switch from the Alabama State Docks Railroad, by truck via a separate road that does not pass through the mill yard, and by barge via the inland waterway system, or via Alabama's fine river system.

Under ordinary conditions, logs 5 ft. 3 in. long will be furnished direct to the barking drums over Jeffrey log conveyors. There are two 12 ft. x 45 ft. D. J. Murray trunnion type barking drums with flat belt drive. After the barking drums, the wood passes a log sorting conveyor and platform where unsatisfactory bolts will be re-routed through the barking drum or submitted to special cleaning processes to remove seams and knots. The bolts are chipped in two 88-in., four-knife Carthage chippers which are equipped with card breaker attachment. These are driven by direct connected General Electric Company synchronous motors.

The chips are next passed over two Orville Simpson Company Rotex chip screens, from which accepted chips are passed to storage. Otherwise, chips are routed through a Waterville Iron Works chip crusher; sawdust and bark are transported via a waste conveyor to the Hofft bark burning furnace.

Accepted chips, clean and of uniform size, are handled on Jeffrey conveyors from chip crusher to digesters. Chip storage is located at ground level, and the storage bin holds a supply adequate for approximately 16 hours' operation. The chips from this bin pass to the top of the digester house where they are distributed to the digesters.

The inclined belt conveyor is equipped with an automatic weightometer and rateograph manufactured by Merrick Scale Manufacturing Company. These instruments record the weight of chips charged to each digester, insuring control of quantity and quality from the start of the operation.

There are four Blaw-Knox digesters, 11 ft. in diameter by 47 ft. over-all height. The digesters are equipped with Fibre Making Processes Company indirect liquor heaters, and circulating pumps so connected as to permit either direct or indirect cooking.

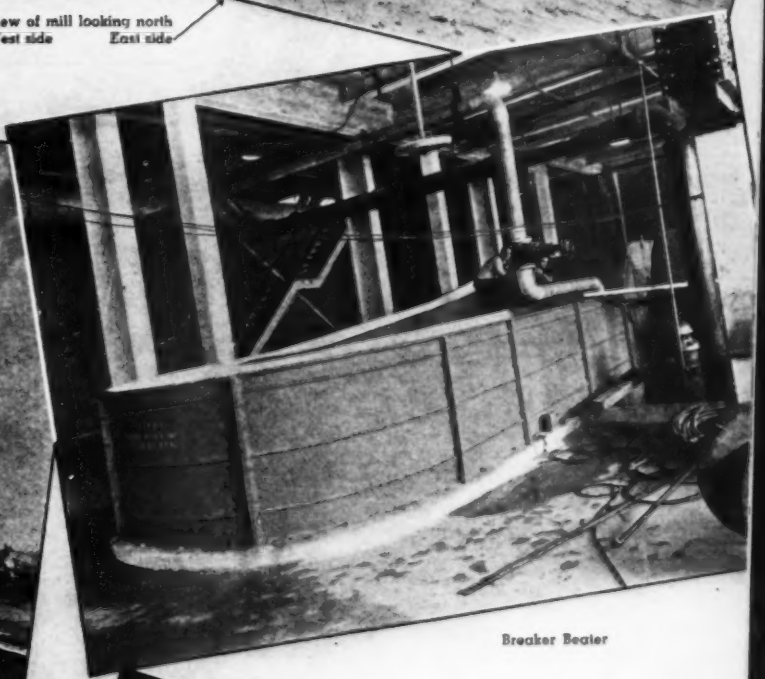
The blow valves are 8 in. diameter, by Reading, Pratt & Cady.

The blow tank and trap, as well as other steel tanks at the mill, were furnished and erected by the Hammond Iron Works.

The heat value of steam in the blowing process is recovered through a Foster-Wheeler flash type blow-down condenser, 16 ft. 4 in. by 8 ft. over-all dimensions.

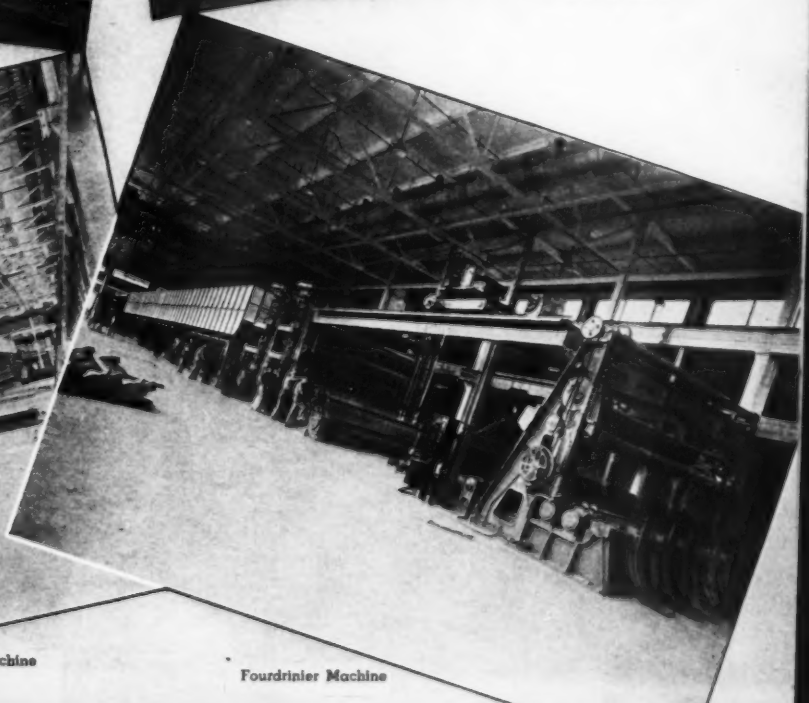
View of mill looking north
West side East side

Power house from outside
machine room basement.



Breaker Beater

Cylinder Machine



Fourdrinier Machine

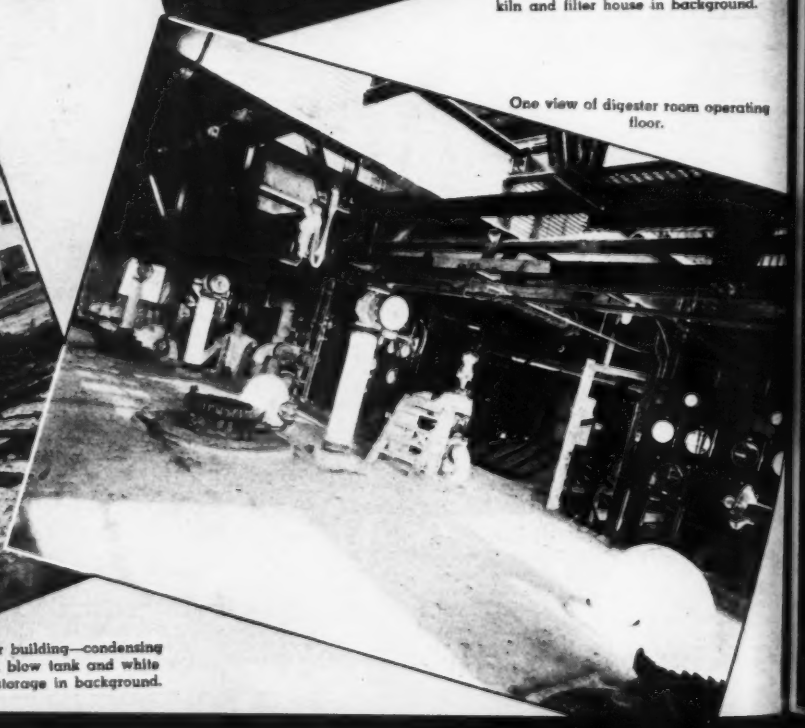
Finishing Room

Jordans and Hydrafiners

Beaters

Barking drums, conveyors, with lime kiln and filter house in background.

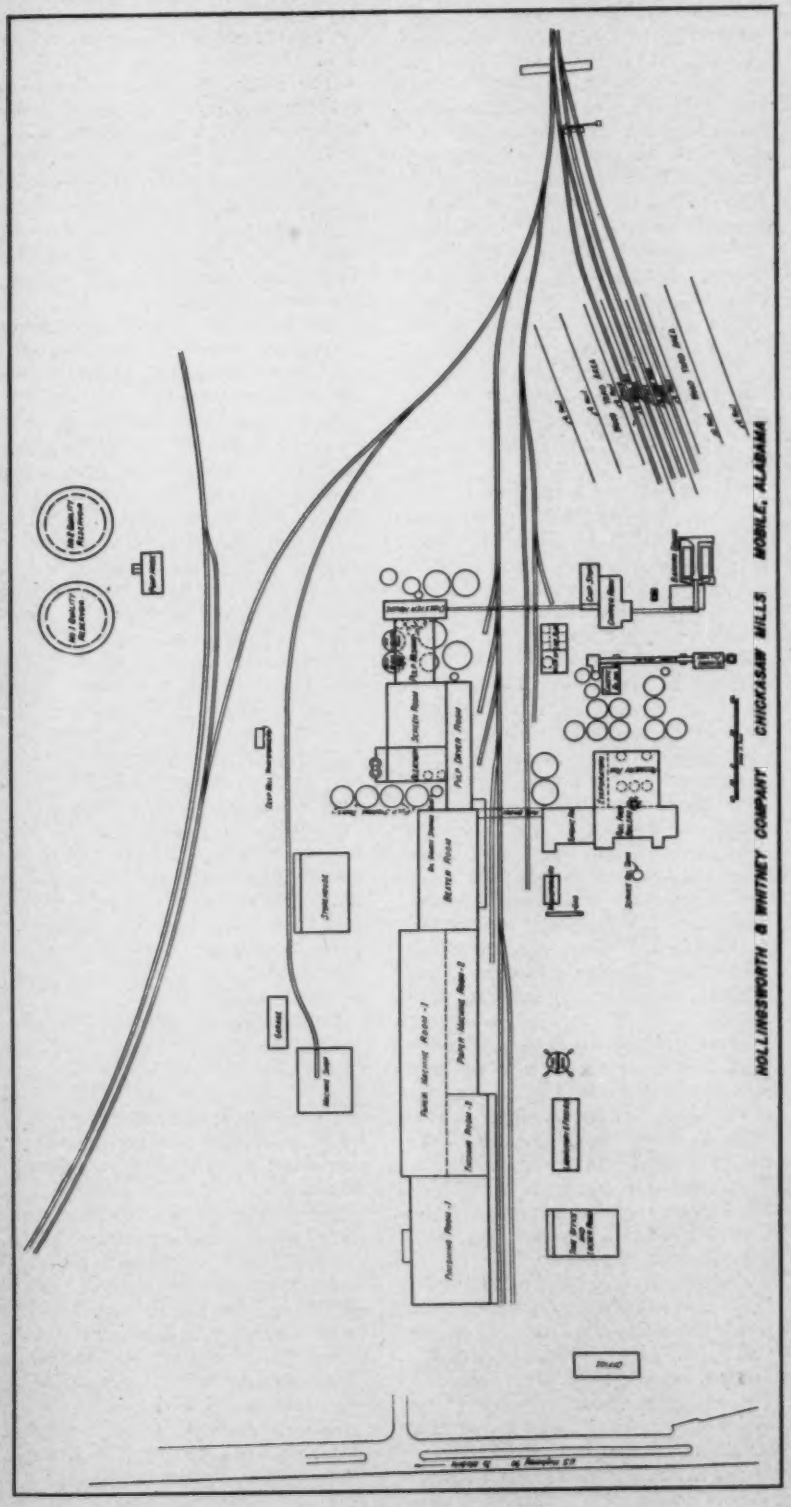
Digester building—condensing system, blow tank and white liquor storage in background.



One view of digester room operating floor.

From the blow tank, the pulp is washed in a 3-stage counter current vacuum washer system consisting of three 8 ft. by 12 ft. washers, each having 300 sq. ft. drainage area, furnished by Improved Paper Machinery Corporation. Tanks beneath the washer system provide for the storage of strong, intermediate and weak black liquor and pulp, and there is a dump tank to permit the removal of pulp from any stage in the event of shut-down.

The pulp next flows to the screen room where a larger screen area than usual has been designed by Impco to produce pulp of unusual cleanliness.



The pulp first passes through three knotters of the type first developed at the company's Waterville mill. Then it flows through a large battery of felt-lined rifflers, constructed of cypress, and then through a battery of centrifugal screens. Finally, it passes through a system of diaphragm-type flat screens equipped with Dunbar drive and bronze vats. Union and Fitchburg screen plates have been installed with Witham screen plate fasteners.

The pulp is then thickened on large Impco vacuum deckers, and thence flows to Stebbins tile-lined storage tanks, where it is thoroughly blended by continuous agitation. The agitator assembly was by the Hill Clutch Machine & Foundry Company.

Provision has been made for production of baled pulp in sheets for which an 80-in. fourdrinier pulp drying machine, from one of the company's northern mills, equipped with a Beloit Iron Works suction couch roll, has been installed. The drying machine is equipped with a Hamblet duplex sheet cutter, a Mathews roller-type conveyor, and a Baldwin-Southwark baling press.

Stock from the screen room may be dried or used in process as brown stock or it may be passed through the bleach plant, which may be considered the next step in the process. Improved Paper Machinery Corporation has supplied Thorne bleaching equipment, producing fully-bleached pulp by a continuous process. All chests and towers in this department are constructed of concrete and were tile lined by the Stebbins Engineering & Manufacturing Company.

In order to eliminate contamination, extensive use has been made of rubber-lined and other special piping, and the operating room of the bleach building is lighted by glass brick panels. The building is ventilated by a forced ventilation system.

Density of stock is controlled by Northern Equipment Company Copes consistency regulators and Impco stock meters.

Chemicals for the preparation of bleach liquor are fed to the system by efficient handling methods. The equipment for sulphur dioxide handling has been supplied by the Virginia Smelting Company.

Pulp at high density is stored in four cylindrical concrete tanks, tile lined by the Stebbins Engineering & Manufacturing Company. The pulp is carried to the tanks by conveyors, and is pumped from them to the pulp drying machine or stock preparing department.

Pulp from the stock storage system is pumped to individual stock thickeners which empty into filling tanks located over each of the seven 2,500-lb. Horne beaters. These beaters, manu-

factured by J. H. Horne & Sons Company, are of a new design developed in collaboration with Robert Nivison, manager of mills of Hollingsworth & Whitney Company.

The size making system consists of a number of tanks supplied by the Mobile Steel Company, together with equipment designed especially for this installation. Wooden tanks for the storage of alum have been supplied by the Hauser-Stander Tank Company.

Following treatment in the beaters, the stock is pumped through a battery of six Dilts Hydrafiners, operating at 1200 r.p.m., capable of passing 700 to 800 g.p.m. of stock at 4½ per cent consistency. Final treatment of the pulp is accomplished by the use of eight jordans manufactured by the Emerson Manufacturing Company.

All motors for this department are controlled from a special battery of General Electric Company cubicles, situated on an elevated bridge in the central part of the building.

Cylindrical stock tanks in this department, and also for the paper machines were constructed by the Stebbins Engineering & Manufacturing Company.

Proper mixing of stock is insured by Noble & Wood propeller-type agitators.

Stock from this department next passes to the paper machines.

Paper Machine No. 1 is a Pusey & Jones 184-in. fourdrinier, with a trim of 164 inches.

This machine is equipped with four Bird screens and a Beloit couch roll.

There is an Impco screen for tailings, and a save-all to handle the white water.

The paper machine is also equipped with:

Midwest-Fulton Machine Company dryer drainage system.
J. O. Ross Engineering Corporation ventilating system and calender blowers.
Whiting Corporation cranes.
General Electric Company sectional motor drive.

Lubricating oil is circulated through a Bowser purifying system.

At the end of the machine, there is a high speed Pusey & Jones slitter and winder for slitting paper into rolls. In the basement are situated a broke beater manufactured by Dilts Machine Works, a Worthington air compressor and Nash vacuum pumps.

Paper Machine No. 2 is a cylinder machine with an improved Pusey & Jones 124-inch stream flow wet end. Incorporated in this machine are new Pusey & Jones stream flow vats recently installed for the first time at the company's mill at Waterville, Maine.

This machine is also equipped with Bird screens, Ross ventilating system and other modern auxiliaries.

It is driven from a line shaft by a General Electric single motor drive with small helper motors at the wet end. This machine is followed by a high speed Langston slitter and winder for production of rolls.

The combined capacity of these two machines is approximately 160 tons per day.

Paper from these two machines progresses to the final building in the production line, on the second floor of which is situated the finishing department. Finishing equipment includes the latest model Hamblet simplex and duplex cutters for the production of sheets, and slitters constructed by the Kidder Press Company, Inc., to produce finished rolls. For small sized sheets and for trimming, the finishing department is equipped with Seybold precision trimmers.

Howe scales and recording devices are used for the weighing of papers.

Paper is transferred by elevator to the ground floor. Elevators in this building and elsewhere were installed by George T. McLauthlin Company of Boston.

The ground floor contains a commodious shipping room. Along the east side of the building extends a shipping platform for rail shipments, while the west side of the building has another covered platform from which shipments may be made by truck.

Outgoing rail shipments from the mill will be handled over the tracks of the State Docks Terminal Railway, from which they may be transferred to any of the five railroad systems serving Mobile, or to steamships.

To the west of the paper machine room, and served by a transfer car, is a machine shop and roll grinder room. In addition to a battery of lathes, drills and other metal and wood working tools, there is a Seybold knife grinder, a Lobdell Car Wheel Company roll grinder and a Bridgeport Safety Emery Wheel Company knife grinder for chipper knife.

Having followed the product through from logs to finished paper, we now turn to the processes for the recovery of chemicals and generation of power.

Strong black liquor removed from the pulp by the first stage washer is transferred to storage tanks from which it is fed to a complete Swenson 6-body, quintuple effect evaporator equipped with La Bour pumps.

From there it passes through two D. J. Murray cascade evaporators from which it emerges at a density of 55 per cent solids.

From a storage tank it is pumped to the Babcock & Wilcox mix tank where desired quantities of make-up salt cake are added. Salt cake which is received in cars has been stored in three conical bottom steel tanks from which it is fed to the mix tanks through Jeffrey conveyors, crusher and weight control device. From the mix tank it is pumped by Worthington pumps to two Babcock & Wilcox Tomlinson recovery units, each of which is capable of handling the black liquor from the production of 95 tons of pulp per day with ample over capacity. Steam capacity is 33,600 lb. per hour at 600 lb. gauge pressure each unit.

The smelt goes to the dissolving tanks from which it emerges as green liquor, through a Worthington pump to the causticizing system. The causticizing system is a Dorr Company installation, consisting of one green liquor clarifier, one dregs washer, one white liquor clarifier, one lime mud washer, one improved type turboslaker and three causticizers.

The system is equipped with Dorrco diaphragm pumps for the lime mud and Worthington and Morris pumps for the liquor.

Lime sludge is pumped to one 8 ft. by 4 ft. Improved Paper Machinery Corporation sludge filter, from which it flows by gravity to an 8 ft. by 160 ft. Vulcan Iron Works rotary lime kiln.

The lime kiln is fired with gas fuel through Coppus-Dennis fan mix type burners. The temperature in the firing zone is controlled by Leeds & Northrup radiation pyrometers.

Fresh and re-burned lime are fed by Link-Belt and Jeffrey conveyors through screens to steel tanks. Lime from these tanks is controlled by Ross feeders.

Additional process steam is generated in three Babcock & Wilcox fuel-fired boilers. One of these boilers is equipped with a Hofft bark burning furnace for the consumption of waste, but may also burn other fuel if required. Boilers are equipped with B. & W. trifuel burners for the consumption of pulverized coal, gas or oil. They have a capacity of 89,000 lb. of steam per hour at 600-lb. gauge pressure.

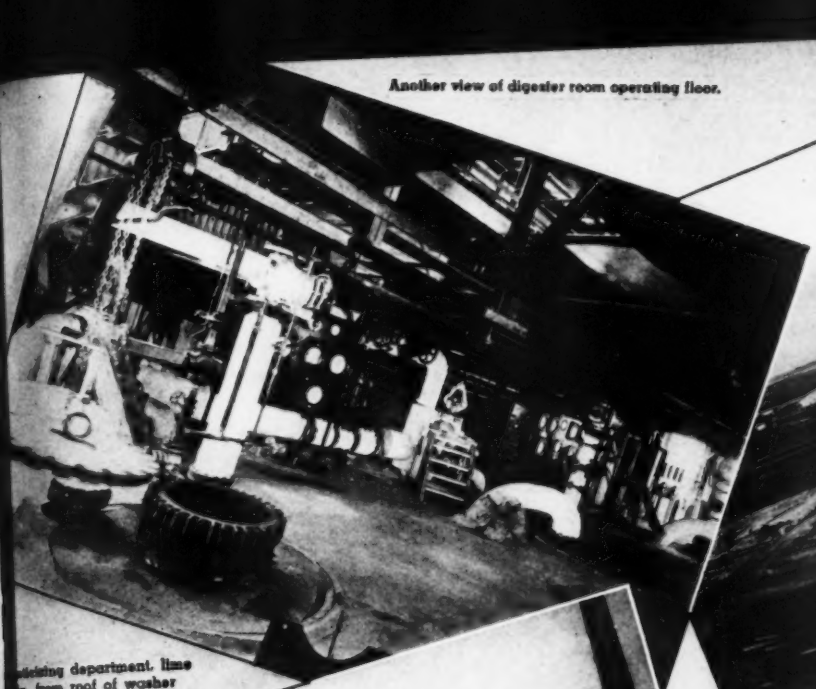
Both fuel-fired boilers and recovery boilers are equipped with Sturtevant forced and induced draft fans and B. & W. air preheaters.

Feed water heaters are manufactured by Worthington, and the boiler feed pumps are manufactured by Ingersoll-Rand.

Recovery units are equipped with Bailey Meter Company meters.

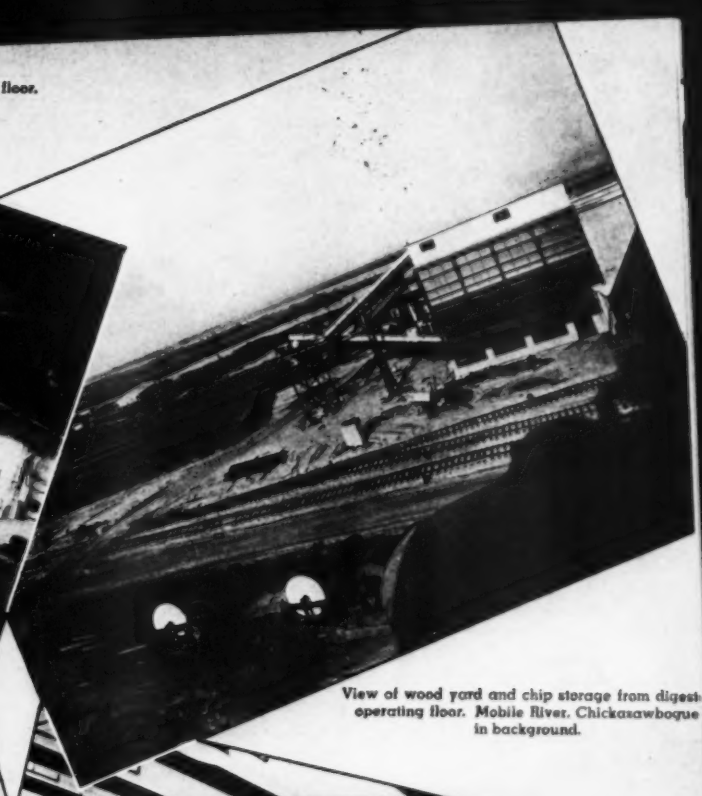
Boilers are equipped with Diamond Power Specialty Company soot blowers and bi-color water gauges and Republic Flow Meters combustion control. Hall Laboratories, Inc., are the company's consultants for boiler feedwater treatment control and service.

Exhaust gases are vented through a single brick smokestack, 225 ft. high, 11 ft. 8 in. in diameter at the top.

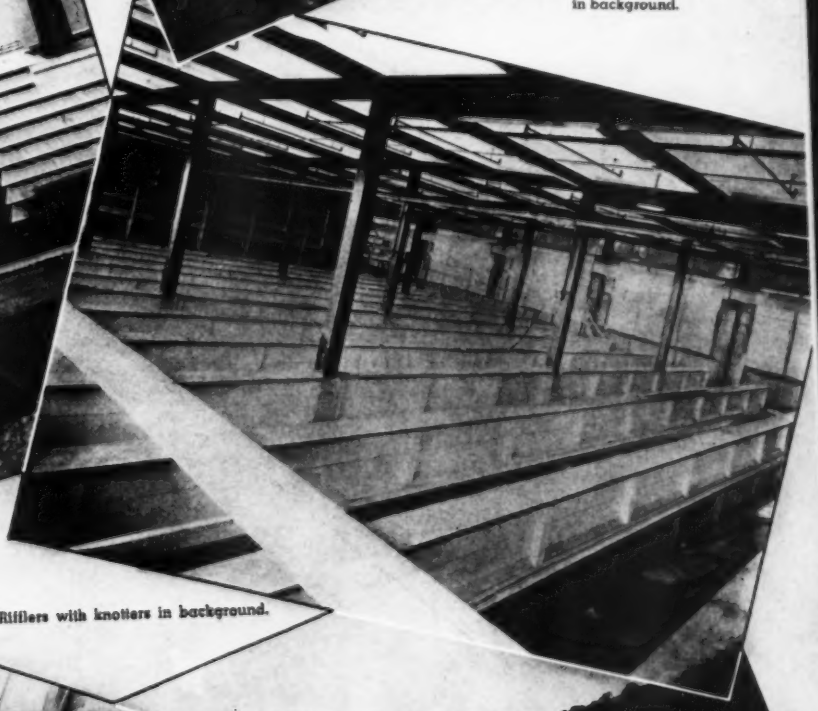


Another view of digester room operating floor.

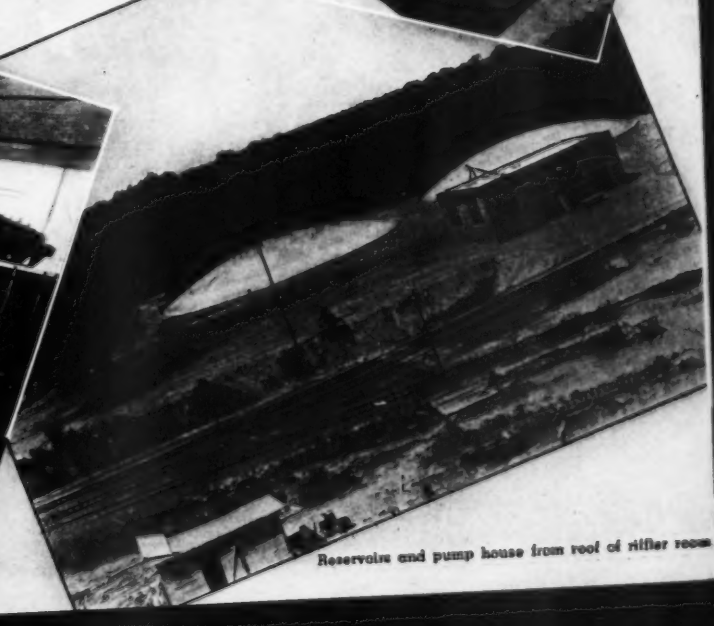
...cking department. lime
...from roof of washer
...m. Part of recovery.
...salt cake storage.



View of wood yard and chip storage from digest
operating floor. Mobile River. Chickasawbogue
in background.

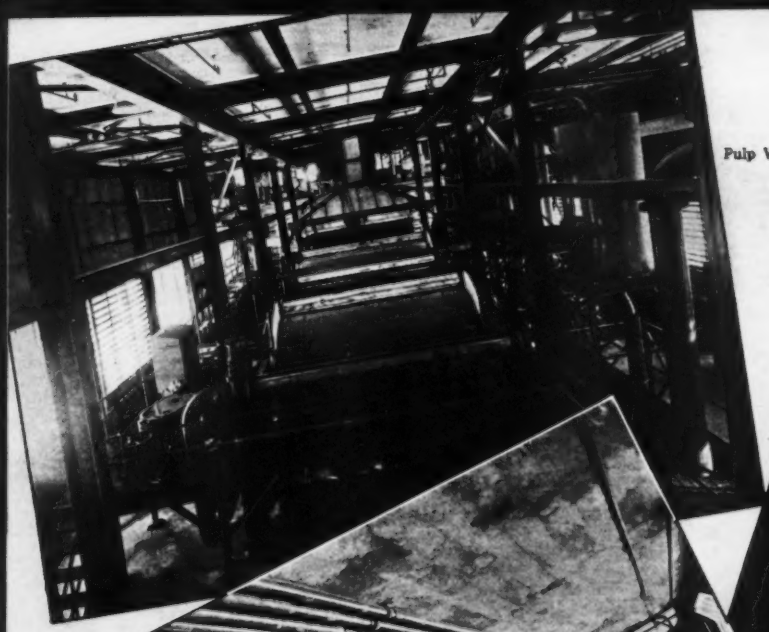


Rifflers with knotters in background.

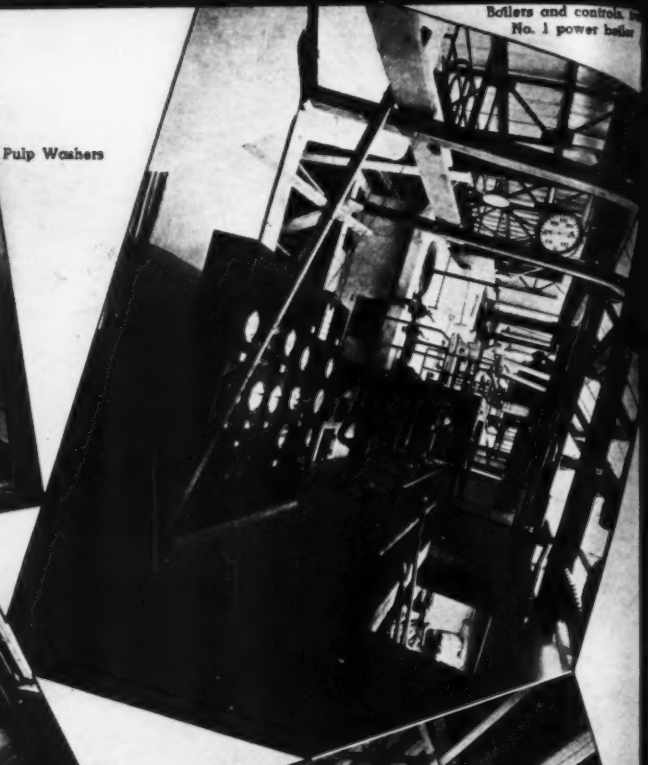


Turbine and Switchboard

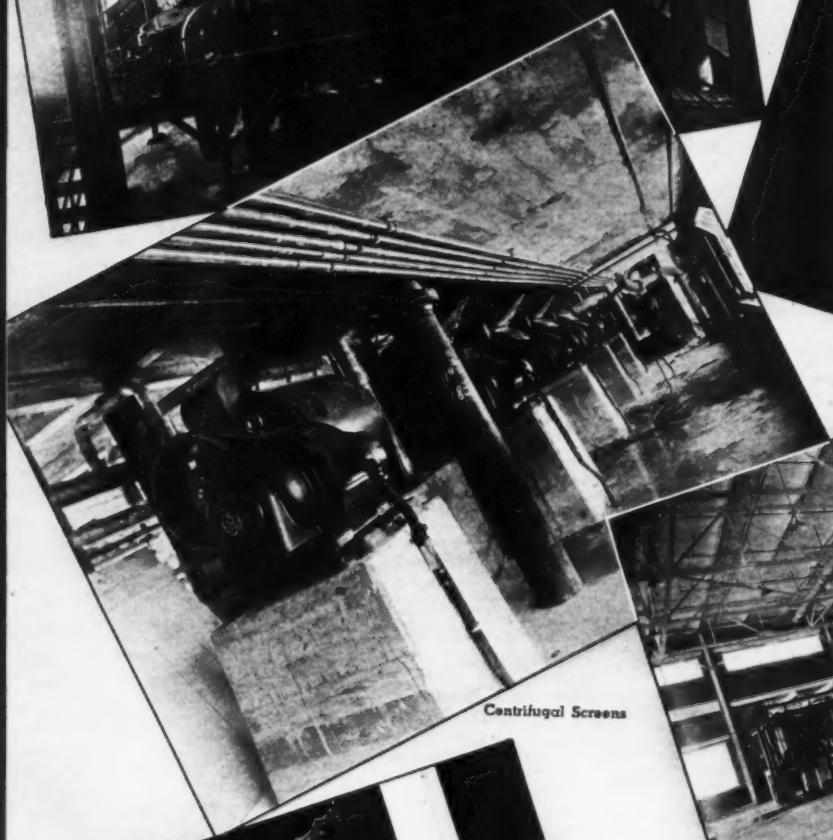
Reservoirs and pump house from roof of riffler room



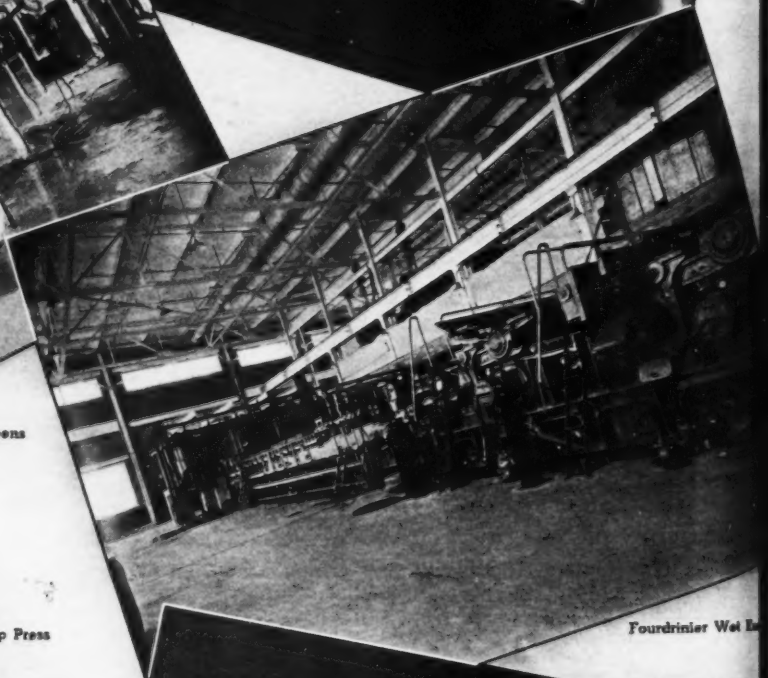
Pulp Washers



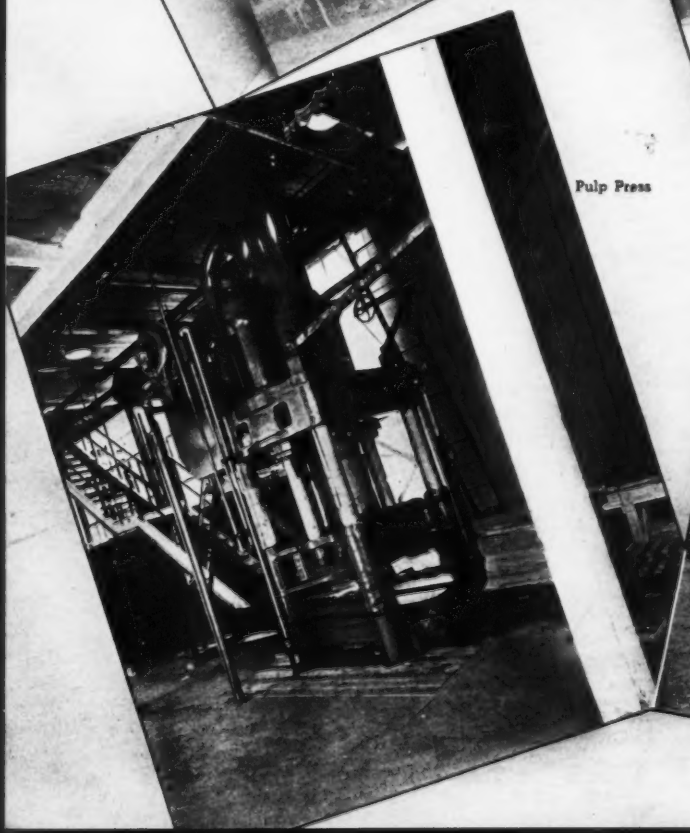
Boilers and controls
No. 1 power boiler



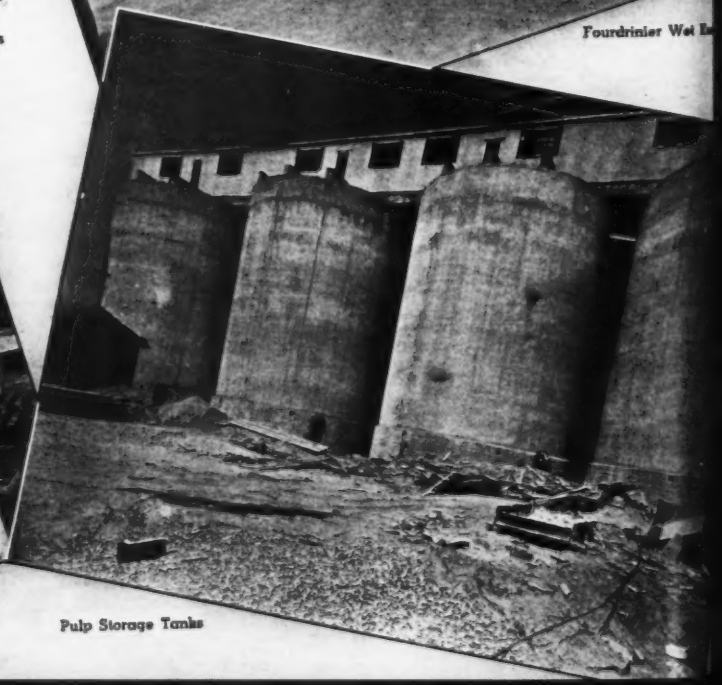
Centrifugal Screens



Fourdrinier Wet E



Pulp Press



Pulp Storage Tanks

The steam is piped to a General Electric 7500 kv-a. turbine which bleeds at 130 lb. pressure for pulp cooking and exhausts at 30 lb. pressure for drying and other process work. Republic reducing valves are used for pressure reduction to 130 lb. and 30 lb. additional steam.

The company obtains a substantial part of its electricity from this turbine, through which all process steam passes, and the supplementary electricity required is supplied by the Alabama Power Company, which has installed at the plant a 22,000/2200 volt—7500 kv-a. transformer bank sub-station adjoining the turbine room.

Power is generated at 2400 volts. All motors in the mill over 50 hp. operate at 2200 volts. Smaller motors operate at 440 volts, receiving current from 2400/480 volt step-down transformer bank located just outside of the turbine room. The company has an arrangement with the Alabama Power Company by which it will supply power to the utilities system in case of public emergency.

The lighting circuit is supplied by individual 440/220/110 volt transformers installed outside of the various buildings. At some distance from the turbine room is a transformer station providing 13,200 volt power to transmission lines serving the deep well pumps.

There are over 500 motors in the mill, ranging in size from ¼ hp. to 1100 hp. Motors were supplied by the General Electric Company.

The mill power is controlled throughout by General Electric cubicle type controls.

The wiring throughout the mill has been installed by the Allegheny Industrial Electrical Company as sub-contractors to the Rust Engineering Company. Extensive use has been made of conduit buried in concrete. Exposed conduit is heavily waterproofed.

At the southeast corner of the mill building fronting on U. S. Highway 90 near the entrance to Cochrane Bridge across Mobile Bay, is situated a group of buildings designed by Fay, Spofford & Thorndike of Boston. The office building is insulated and fully air conditioned to provide the optimum working conditions for the staff controlling the company's operations at Mobile. The upper sash of this building is glazed with Coolite heat resisting glass.

In the rear of the office building are situated the time room office and locker building in which company payroll records are centralized, and which contain shower baths and individual locker facilities. This building is equipped with an efficient ventilating system.

The building north of this houses the laboratory and first aid department. Efficient insulation from the outside atmosphere was the prime factor under consideration in the planning of this building which is lined with hollow tile. The building is air conditioned, and complete facilities are provided for physical and chemical analysis. The first aid department is in the north end of the building, consisting of a dispensary, a first aid room, and a hospital room.

The greatest attention has been paid to the development of an adequate high quality water supply. To this end, the Layne-Central Company was engaged to supply and construct a deep well water system consisting of 25 wells extending several miles northwest of the mill site. These wells are equipped with Layne-Bowler pumps. Water is obtained from two different strata, and each stratum has its own chemical characteristics, though both are of high quality. So careful has the company been to preserve exact characteristics of product that a complete duplicate pipe line and reservoir system has been installed throughout the mill to carry to each process the water of the characteristics best adapted for use.

The pipe line from the wells is of Armco spiral welded steel, bitumastic lined. The lining was applied under the supervision of the Wailes Dove Hermiston Company.

The Layne-Central Company erected the pipe line and electric transmission line controlling the General Electric motors driving each well pump.

At the end of the pipe line and adjacent to the plant are two storage basins for transit storage consisting of two concrete reservoirs with concrete dome covers holding 1,250,000 gallons each. The water is aerated in these tanks, which were constructed by the National Gunite Contracting Company by the prestress method.

A pump house containing three pumps insures a full supply of water to the mill. One of these pumps is a spare. In addition there are two fire pumps. All of this equipment was manufactured by Goulds Pumps, Inc.

Valve connections and controls have been installed to meet any emergency condition which may cause a failure in part of the system.

A complete fire protection system has been designed with the advice of the Associated Factory Mutual Insurance Companies of Boston, including a 125,000 gallon elevated sprinkler supply tank supplied by the Chicago Bridge & Iron Works, Ludlow hydrants, and Rust hose houses. Sprinklers in all combustible buildings were installed by the Grinnell Company, Inc.

In addition to the piping installed by the Layne-Central Company, two other piping contractors contributed to the job.

All outside water piping was installed by the Pittsburgh Piping & Equipment Company under a sub-contract with the Rust Engineering Company.

All inside steam, water and process piping was installed by the Grinnell Company, Inc.

Insulation of steam piping and certain process tanks is glass manufactured by and erected under the direction of engineers of Owens-Corning Fiberglas Corporation of Toledo, Ohio.

Valves throughout the mill were supplied by:

Chapman Valve Manufacturing Company
DeZurik Shower Company
Reading, Pratt & Cady
Hills-McCanna Company
Yarnall Waring Company
Golden Anderson Valve Specialty Company
The Wm. Powell Company

Effluent from the various mill processes flows through a sewer system which contains a weir in each department. These weirs are equipped with recording instruments to keep a measurement of all wastes voided. The main sewer flows through a large settling basin on company property where objectionable foreign matter is removed before water leaves the mill site.

General building construction is divided into several types:

In buildings where tight construction is of paramount importance, brick walls have been used.

In other process buildings, Transite siding fastened to steel girts replaces the brick.

In locations where maximum ventilation is desired, such as the boiler plant, an open louvre Transite construction has been used.

Certain processes, such as the barking drum and lime kiln, have not been housed.

All manufacturing buildings are of steel frame construction with reinforced concrete floors. Steel sash has been used throughout except for the glass brick on the operating floor of the bleach plant.

In sprinklered buildings, built-up bonded wood roofs have been used.

Elsewhere, roofs are of pre-cast concrete slab.

Instruments and controls throughout the mill were supplied by:

Republic Flow Meters Company
Taylor Instrument Companies
Bailey Meter Company
Leeds & Northrup
Manning, Maxwell & Moore
Brown Instrument Company
Fischer & Porter Company
Mason-Neilan Regulator Company
Foxboro Company

Pumps for water, white water, and

many other process uses were supplied by Goulds Pumps, Inc.

Special stock pumps were supplied by the Bingham Pump Company, Portland.

Other special pumps were supplied by the Worthington Pump & Machinery Corporation.

All parts of the mill will be kept in constant communication with the management office by an intra-plant telephone system installed by Southern Bell Telephone Company.

A system of synchronized International Business Machines time clocks has been installed in the mills, and other I.B.M. equipment will be used in the office. Office equipment is by Remington Rand, Inc.

Allis-Chalmers Texrope drives, Falk couplings and gear reducers have been used extensively in machinery drives.

Equipment and Supplies

Following is a list of manufacturers and the equipment they supplied:

Aerofin Corp., Syracuse, N. Y.—*Heaters.*

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.—*V-Belt drives.*

American Blower Co., Detroit, Mich.—*Blowers.*

American Cast Iron Pipe Co., N. Birmingham, Alabama—*Cast iron pipe and fittings.*

American Rolling Mills Co., Middletown, Ohio—*Spiral welded steel pipe.*

American Steel & Wire Co., Cleveland, Ohio—*Steel cable, wire mesh, welding wire fabric.*

Babcock & Wilcox Co., New York City—*Air preheater, recovery furnaces (2), boilers (1 equipped with bark-burning furnace).*

Bailey Meter Co., Cleveland, Ohio—*Instruments.*

Baldwin Southwark Corp., Philadelphia, Pa.—*Baling press.*

Beloit Iron Works, Beloit, Wis.—*Couch roll.*

Bingham Pump Co., Portland, Ore.—*Pumps.*

Bird Machine Co., S. Walpole, Mass.—*Screens.*

Blaw-Knox Co., Pittsburgh, Pa.—*Digesters (4).*

S. F. Bowser & Co., Inc., Fort Wayne, Ind.—*Oil purifying system.*

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.—*Knife grinders.*

Brown Instrument Co., The, Philadelphia, Pa.—*Instruments.*

Carthage Machine Co., Carthage, N. Y.—*Chippers.*

Chapman Valve Mfg. Co., Indian Orchard, Mass.—*Valves.*

Chicago Bridge & Iron Works, Chicago—*Sprinkler tank.*

Crane Co., Chicago—*Pipe and fittings.*

Cutler-Hammer, Inc., Milwaukee, Wis.—*Instruments.*

Coppus-Dennis Eng. Corp.—*Gas burner.*

DeZurik Shower Co., Sartell, Minn.—*Valves.*

Diamond Power Specialty Co., Detroit, Mich.—*Soot blowers and bi-color water gauges.*

Dilts Machine Works, Inc., Fulton, N. Y.—*Hydrafiners (6), broke beater.*

Dorr Co., New York City—*Causticizing system.*

Duriron Co., Inc., Dayton, Ohio—*Specialty pumps.*

Dresser Mfg. Co., Bradford, Pa.—*Pipe couplings.*

Du Pont de Nemours & Co., E. I., Wilmington, Del.—*Paint.*

Elliot Co., Jeanette, Pa.—*Water strainers.*

Elwell-Parker Electric Co., Cleveland, Ohio—*Trucks.*

Emerson Mfg. Co., Lawrence, Mass.—*Jordans.*

Falk Corp., Milwaukee, Wis.—*Couplings and gear reducers.*

Fibre Making Processes, Inc., Chicago—*Indirect liquor heaters and pumps.*

Fischer & Porter Co., Philadelphia, Pa.—*Instruments.*

Fitchburg Screen Plate Co., Inc., Fitchburg, Mass.—*Screen plates.*

Foster-Wheeler Corp., New York City—*Digester blow-down condenser.*

Foxboro Co., Foxboro, Mass.—*Instruments.*

General Electric Co., Schenectady, N. Y.—*Motors and controls, paper machine drives, turbine-generator, cubicle type controls.*

General Fire Extinguisher Co., Providence, R. I.—*Sprinklers.*

Golden-Anderson Valve Specialty Co., Pittsburgh, Pa.—*Valves.*

Goodrich Co., B. F., Akron, Ohio—*Conveyor belt, roll covering (rubber).*

Goulds Pumps, Inc., Seneca Falls, N. Y.—*Pumps.*

Grinnell Co., Inc. Providence, R. I.—*Piping, ventilating equipment, rubber lined and special piping.*

Hall Laboratories, Inc., Pittsburgh, Pa.—*Feed water treatment.*

Hamblet Machine Co., Lawrence, Mass.—*Paper cutters.*

Hammond Iron Works, Warren, Pa.—*Tanks.*

Harbison Walker Refractories Co., Pittsburgh, Pa.—*Fire brick.*

Harris-Seybold-Potter Co., Dayton, Ohio—*Trimmers and knife grinder.*

Hauser-Stander Tank Co., Cincinnati, Ohio—*Alum tanks.*

Hill Clutch Machine & Foundry Co., Cleveland, Ohio—*Agitators.*

Hills - McCanna Co., Chicago—*Valves.*

Hofft Co., M. A., Indianapolis, Ind.—*Furnaces.*

Horne & Sons Co., J. H., Lawrence, Mass.—*Beaters (7).*

Howe Scale Co., Rutland, Vt.—*Scales.*

Improved Paper Machinery Corp., Nashua, N. H.—*Knotters (3), pulp screens, deckers, tailing screens, thickeners (7), pulp washers, bleaching equipment, lime sludge filter.*

Ingersoll-Rand Co., Phillipsburg, N. J.—*Boiler feed pumps.*

Jeffrey Mfg. Co., Columbus, Ohio—*Conveyors.*

Johns-Manville Sales Corp., New York City—*Special building siding.*

Kidder Press Co., Inc., Dover, N. H.—*Rewinders, slitters.*

Knight, Maurice A., Akron, Ohio—*Chemical stoneware pipe.*

La Bour Co., Inc., Elkhart, Ind.—*Pumps.*

LaClede-Christy Clay Products Co., St Louis, Mo.—*Fire brick.*

Langston Co., Samuel M., Camden, N. J.—*Winder.*

Layne Central Co., Memphis, Tenn.—*Deep well pumps.*

Leeds & Northrup Co., Philadelphia, Pa.—*Instruments.*

Link-Belt Co., Chicago—*Conveyors.*

Lobdell Car Wheel Co., Wilmington, Del.—*Roll grinders.*

Ludlow Valve Mfg. Co., Troy, N. Y.—*Hydrants.*

Manning, Maxwell & Moore, Inc., (Consolidated Ashcroft Hancock Div.), Bridgeport, Conn.—*Instruments.*

Mason-Neilan Regulator Co., Boston, Mass.—*Regulators.*

Mathews Conveyor Co., Ellwood City, Pa.—*Pulp conveyor.*

Merrick Scale Mfg. Co., Passaic, N. J.—*Chip weighing scale.*

Midwest-Fulton Machine Co., Dayton, Ohio—*Dryer drainage system.*

Morris Machine Works, Baldwinsville, N. Y.—*Pumps.*

Murray Mfg. Co., D. J., Wausau, Wis.—*Barking drums, black liquor evaporators (2).*

Nash Engineering Co., South Norwalk, Conn.—*Vacuum pumps.*

Noble & Wood Machine Co., Hoosick Falls, N. Y.—*Agitators.*

Northern Equipment Co., Erie, Pa.—*Consistency regulators.*

Orville Simpson Co., Cincinnati, Ohio—*Chip screens.*

Owens - Corning - Fiberglas Corp., Toledo, Ohio—*Insulation.*

Pittsburgh Piping and Equipment Co., Pittsburgh, Pa.—*Piping.*

Powell Co., The Wm., Cincinnati, Ohio—*Valves.*

Pusey and Jones Corp., Wilmington,

(*Concluded on page 694*)

PAPER SKETCHES

PILGRIMS OF THE PLYMOUTH COLONY USED PAPER SOAKED WITH LINSEED OIL FOR WINDOW PANES RATHER THAN GLASS.
BEFORE THE ADVENT OF THE FOURDRINIER, A "DAY'S WORK" FOR A CREW OF THREE PAPERMAKERS WAS ABOUT 2,260 SHEETS SIZE 30" X 20".
26,900 TONS PER MONTH 1937
42,200 TONS PER MONTH 1940
WOOD PULP
EXPORT SHIPMENTS FROM THE UNITED STATES WERE GREATER FOR THE FIRST EIGHT MONTHS OF 1940 THAN FOR ANY SIMILAR PREVIOUS PERIOD. THESE SHIPMENTS AVERAGED 42,200 TONS PER MONTH AS CONTRASTED WITH 26,900 TONS PER MONTH IN 1937, THE PREVIOUS HIGH YEAR.
JOURNEYMEN OF EARLY 19TH CENTURY SHEFFIELD, ENGLAND, OBSERVED THAT WATER WHEEL BEARINGS OF LAMINATED BROWN PAPER WITHSTOOD HEAT AND WEAR AMAZINGLY WELL.

(*Continued from page 692*)

Del.—*Fourdrinier machine, cylinder machine vats, slitter and winder.*

Reading-Pratt and Cady Div. (American Chain and Cable Co.), Bridgeport, Conn.—*Valves.*

Republic Flow Meters Co., chicago —*Reducing valves and desuperheater, combustion control system, instruments.*

Ross Engineering Corp., J. O., New York City—*Ventilating equipment.*

Stebbins Engineering & Mfg. Co., Watertown, N. Y.—*Tile-lined towers, chests, storage tanks; stock tanks.*

Stowe-Woodward, Inc., Newton Upper Falls, Mass.—*Roll covering (rubber).*

Swenson Evaporator Co., Harvey, Ill.—*Black liquor evaporator.*

Taylor Instrument Cos., Rochester, N. Y.—*Instruments.*

Toledo Scale Co., Toledo, Ohio—*Scale.*

Truscon Steel Co., Youngstown, Ohio—*Steel window frames.*

Tyer Rubber Co., Andover, Mass. —*Roll covering (rubber).*

Union Screen Plate Co., Fitchburg, Mass.—*Screen plates.*

U. S. Rubber Products, Inc., New York City—*Roll covering (rubber).*

Vulcan Iron Works, Wilkes-Barre, Pa.—*Lime kiln.*

Wailes Dove-Hermiston Corp., New York City—*Pipe lining.*

Waterville Iron Works, Waterville, Me.—*Chip crusher.*

Watson-Flagg Machine Co., Paterson, N. J.—*Special reduction units.*

Whiting Corp., Harvey, Ill.—*Cranes.*

Worthington Pump and Machinery Corp., Harrison, N. J.—*Pumps, feed water heater, air compressor.*

Yale & Towne Mfg. Co., Philadelphia, Pa.—*Overhead trolley and hoists.*

Yarnall-Waring Co., Philadelphia, Pa.—*Valves.*

Other companies that furnished equipment and/or supplies, or that rendered service to the new plant are as follows:

American Brass Co., Waterbury, Conn.

Cooper Alloy Foundry Co., Elizabeth, N. J.

Dodge Manufacturing Corp., Mishawaka, Ind.

Fairbanks Co., New York City.

Fisher Governor Co., Marshalltown, Iowa.

Foster Engineering Co., Newark, N. J.

Garlock Packing Co., Palmyra, N. Y.

Goetze Gasket and Packing Co., New Brunswick, N. J.

Metal & Thermit Corp., New York City.

Philadelphia Gear Works, Philadelphia, Pa.

Record Foundry & Machine Co., Livermore Falls, Me.

Ruggles Klingeman Mfg. Co., Salem, Mass.

Sherwin-Williams Paint Co., Cleveland, Ohio.

Strong, Carlisle and Hammond Co., Cleveland, Ohio.

Virginia Smelting Co., West Norfolk, Va.

ASSOCIATIONS

N. P. T. A. HOLDS SUCCESSFUL MEETING

One of the largest and most successful meetings of the National Paper Trade Association was held September 23-25 when that body met in Chicago at the Stevens Hotel. In addition to the many instructive and valuable discussions which took place at the various divisional meetings, members and guests were able to witness the latest and finest products of paper manufacturers. The entire fifth and sixth floors were devoted to exhibits of innumerable articles serving a variety of needs.

Bringing all factors of the paper trade into sharp focus, the Industry Meeting on September 23 was a powerful success. Such speakers as E. W. Tinker, secretary of the American Paper and Pulp Association, who spoke on the trend of costs; Charles W. Boyce, vice president of the Northwest Paper Company and former secretary of the A.P.P.A., who discussed prices, and J. M. Conway, president of the Tissue Association and the Hoberg Paper Company, who delivered a nine-point program to follow this winter, all revealed the wide knowledge of facts which will aid the trade in the future.

W. F. Lawrence, president of the Bryant Paper Company, Adam C. Remley of the Nekoosa-Edwards Paper Company and J. K. Javits, counsel for the Association, all contributed greatly to furthering knowledge of various phases of the paper industry and trade.

In addition to this general session, the three-day meeting was divided into group meetings at which special discussions and talks were the order of the day.

Of special interest was the talk given by W. S. Devereaux at the Paper and Twine Luncheon, September 24. Mr. Devereaux spoke on the work of the Federal Bureau of Investigation on Fifth Column activities.

The exhibits were too numerous to describe individually. However, it must be said that every one contained attractive displays showing the great variety of items manufactured from paper. Several attracted unusual attention; particularly those of the Union Bag and Paper Corporation whose colorful jungle scene (equipped with a live "native" and all) was oustanding; the Sutherland Paper Company which displayed a great many products for home and commercial use; the Orchard Paper Company which had about the largest display of Christmas and holiday wrappings; The Dixie-Vortex Company which presented cups of all shapes, sizes and purposes; and the Central Paper Company which showed a diorama revealing how its gummed tape is made.

An interesting sidelight was revealed at the convention by the Peninsular Paper Company which reported that its special target paper is finding ready customers. This is due to defense preparations which have stimulated interest in shooting by police departments, schools, clubs, etc.

◆

MAINE-N. H. TAPPI PLANS FIRST MEETING

Plans for the first meeting of the Maine-New Hampshire Section of the Technical Association of the Pulp and Paper Industry, to be held October 25-26, are now under way and the organization committee has been appointed.

W. E. Braun, Pejepscot Paper Company, is chairman of the organization committee. Other members are: G. D. Bearce, Maine Seaboard Paper Company; E. P. Ingalls, S. D. Warren Company; Clifford Patch, Eastern Corporation; T. F. Spear, Oxford Paper Company; Gust. Johanson, Penobscot

Want MORE LIGHT?

YOU can't see what goes on inside your steam cylinders. But you've got to know that the lubrication is *right*.

• • •

PERHAPS YOU'VE BEEN WONDERING: Are you getting complete atomization at today's high pressures? What's the remedy for those valves that chatter now and then? Is it possible that you are using more oil than you need—or that you are risking damage by using too little oil?

There's no need for you to *stay* in the dark. Shell's lubrication men can bring you the light gained from experience with hundreds of steam cylinders, doing all kinds of jobs, in every section of the country.

Shell has the correct lubricant to maintain *your* machines at their greatest efficiency. For Shell's unrivaled laboratories and refineries have developed lubricants to meet actual operating conditions. Time and again these lubricants, when adopted, have brought about substantial savings.

The skill and experience of the Shell men are at your service at any time. Why not call them in for consultation—today?

SHELL

SHELL INDUSTRIAL LUBRICANTS

Chemical Fibre Company; N. L. Nourse, Brown Company; O. E. Anderson, International Paper Company; A. B. Andrews, P. de C. Bray, University of Maine; T. M. Barry, Fraser Companies, Inc., and G. A. Richter, Brown Company.

The University of Maine will be host to the first meeting. All former students interested in pulp and paper and allied industries as well as all mill executives, chemists, and engineers, and superintendents, have been invited and urged to attend.

A number of interesting papers are to be presented including a talk on "Vocational Training" by H. G. Noyes of the Oxford Paper Company; a description of some new plastics by A. E. Norton, consultng chemist, and an outline of research activities at the University of Maine by Professor J. G. Caulfield of that institution. At the banquet, brief talks will be made by President Hauck and Dean Cloke of the University followed by entertainment by the Glee Club.

◆

POWER SHOW TO ATTRACT MANY

Manufacturers of power plant equipment and mill supplies are showing lively interest in the forthcoming 14th National Exposition of Power and Mechanical Engineering to be held at the Grand Central Palace, New York City, December 2-7. The Power Show is to be held at the same time as the annual meeting of the American Society of Mechanical Engineers.

It was reported that reservations for exhibition space are rapidly being taken up and that to date more than 270 firms have contracted for space. Charles F. Roth, president of the International Exposition Company, is in complete charge of the exposition.

◆

INTERESTING PROGRAM FOR CHEM. EXPOS.

Chemistry, its applications and progress in many fields, will be discussed by foremost authorities in America at the Industrial Chemical Conference, which will be a feature of the National Chemical Exposition to be held December 11-15, at the Stevens Hotel, Chicago.

Announcement has been made that the directors of the exposition, sponsored by the Chicago Section of the American Chemical Society, believe that its objectives may be enhanced by furnishing the latest scientific information as well as practical education that will result from a visit to the exhibition.

"We have arranged for this Industrial Chemical Conference, an excellent program of papers in the nature of symposia on 'Newer Developments in Chemistry and Chemical Engineering,'" said Dr. R. C. Newton, chairman of the show committee. "The program is timed to afford those who wish to hear the talks in which they are interested ample opportunity also to view the show." Allen Abrams, technical director of Marathon Paper Mills, Rothschild, Wisconsin, will preside at one of the sessions.

◆

IRON & STEEL ENGINEERS' CONVENTION

One of the most interesting and impressive programs in the history of the Association of Iron and Steel Engineers was presented at the Hotel Stevens September 24-27 when that body held its 36th Annual Convention and Iron and Steel Exposition.

The technical program was larger than ever at this meeting; the nine individual sessions including twenty-seven papers covering a materially broadened range of the various phases of steel plant operation and engineering. These papers were offered under six engineering divisions of the Association: electrical, mechanical, combustion, lubrication, welding, and operating practice.

Of major importance was the exposition itself which this year presented a more comprehensive coverage of the interests of engineers and operators in the iron and steel industries. Located in the Exhibition Hall and also in the Ballroom of the Stevens Hotel were numerous exhibits showing the equipment of around 100 firms.

Prominent among these exhibits were those of the Askania Regulator Company, Automatic Transportation Company, Baker Raulang Company, Bantam Bearings Corporation, Blaw-Knox Company, Bristol Company, Brown Instrument Company, Clark Controller Company, Cleveland Crane and Engineering Company, Cutler-Hammer, Inc., Elwell-Parker Electric Company, Farrel-Birmingham Company, Inc., Garlock Packing Company, Gatke Corporation, General Electric Company, Hall Laboratories, Inc., Homestead Valve Manufacturing Company, Hyatt Bearings Division, Koppers Company, Link-Belt Company, Norma-Hoffmann Bearings Corporation, Poole Foundry and Machine Company, Reeves Pulley Company, Reliance Electric and Engineering Company, Republic Flow Meters Company, Rollway Bearing Company, Inc., Joseph T. Ryerson and Sons, Inc., SKF Industries, Inc., Socony-Vacuum Oil Company, Inc., Tide Water Associated Oil Company, Timken Roller Bearing Company, John Waldron Corporation, Westinghouse Electric and Manufacturing Company and Yale & Towne Manufacturing Company.

◆

CONVENTIONS AND COMING EVENTS

Nov. 1-2—American Pulp and Paper Mill Superintendents Association, Southeastern and Southern Divisions, Savannah, Georgia.

Nov. 13-14—Purchasing Agents Association of Chicago, Annual Products Exposition, Hotel Sherman, Chicago.

Dec. 2-7—Fourteenth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.

Dec. 11-15—National Chemical Exposition, Stevens Hotel, Chicago.

April 1-4—Eleventh Packaging Exposition and Conference, Stevens Hotel, Chicago.

◆

WELLER NEW CHAIRMAN OF MICH. SUPTS.

Arnold Weller, superintendent of the Sutherland Paper Company's board division, was elected chairman of the Michigan Division of the American Pulp and Paper Mill Superintendents Association at the annual meeting on September 19 in Kalamazoo, Michigan. Mr. Weller succeeds Lester La Liberte of the Kalamazoo Vegetable Parchment Company who remains on the advisory board.

Other new officers of the Michigan Division are: Henry Nendorf, Rex Paper Company, first vice chairman; Alfred Perlick, Kalamazoo Vegetable Parchment Company, second vice chairman, and Glenn Sutton, Sutherland Paper Company, secretary-treasurer.

At the meeting, A. Fred Crossman, Cleveland, president of the Lindsay Wire Weaving Company, explained new developments in the manufacture and use of wire cloth for paper mills. Mr. Crossman illustrated his talk with a motion picture of the manufacturing process.

◆

▶▶▶ ONE OF THE MOST FASCINATING printed advertising pieces that has come to the attention of the trade is a 52-page book issued by the Parker-Young Company, Lincoln, N. H., and comprising as many pages of beautiful White Mountain scenes plus a number that show logging and manufacturing operations.

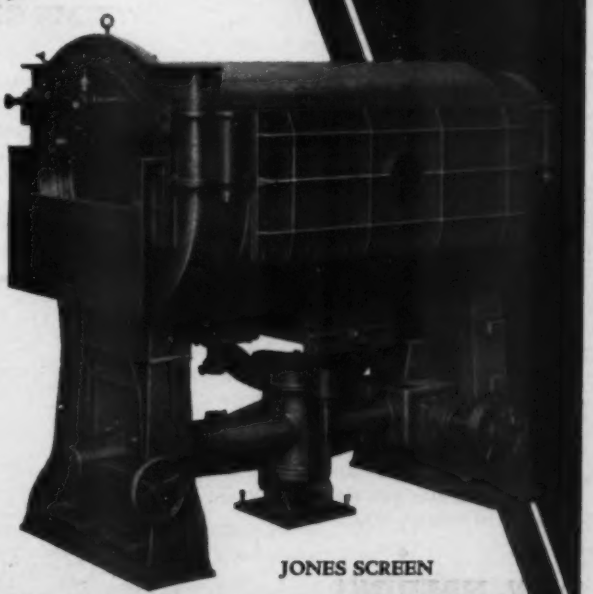
STOCK PREPARATION . . .

Only as good as the Screening it gets!

In each important step of preparing stock every effort may be made to produce a good paper, but such effort is only as effective as the screening the stock gets. Correct screening is of vital, final importance. Here stock uniformity—with its resultant sheet formation, weight control, and dirt removal, is accomplished.

The Jones Screen provides control of these functions efficiently and economically by many advanced features of design and operation. Spacious vat and drum assure gentle screening so important to stock uniformity. The drum and vat design with adjustable stroke permits volume control and assures effective elimination of light and heavy dirt, lumps, strings, clogging, etc.

The Jones Screen Bulletin gives the facts on obtaining desirable paper qualities with use of the Jones Screen. Write for copy.



JONES SCREEN

Jones

E.D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

ALLIED

MATHIESON BUILDING NEW PLANT

A new plant, which will cost about $400,000, is now being built by Mathieson Alkali Works, Inc., at Niagara Falls, to produce sodium chlorite—the newly-developed chemical that promises to have wide use in the wood pulp, textile and other industries.

The new chlorite plant which is expected to be completed early in 1941, is located near the present Mathieson plant at Niagara Falls. The design of the plant gave rise to many difficult engineering and operating problems and before some of them could be solved, a small experimental plant had to be built and operated for two years. High-grade alloys are used to a large extent in constructing the necessary equipment.

Sodium chlorite, although long known as a laboratory chemical, was discovered by the Mathieson research organization to have special properties that make it valuable for use in many important industries. The chemical will bleach kraft wood pulp as white as book paper pulp, it is claimed, and will not weaken the fibers.

◆

NEW ADDITIONS AT BANTAM BEARINGS

The Bantam Bearings Corporation, South Bend, Indiana, is now completing new additions to the office and factory. Officials state that the new additions are necessitated by the increasing volume of quill, roller and ball bearing sales. About one-third more floor space will be added to the present factory to accommodate new equipment and facilities. The laboratory is to be enlarged and the offices are to be air-conditioned and modern in every detail.

◆

D. W. HAERING EXPANDS RESEARCH

In order to permit additional studies in the fields of scale and corrosion control additional facilities have been added to the D. W. Haering & Company's Chicago research laboratories. Among the more interesting additions is a group of experimental cooling systems designed to duplicate operating conditions while permitting control of variables.

These experimental systems include heat transfer units, redwood towers, circulating pumps and experimental sections for removal and observation. Temperatures, water velocities and wind velocities may be varied at will. Six identical units make it possible to run six operating experiments under the same atmospheric conditions reducing variables to controlled characteristics for experimental studies. These units will be used for experimental studies of the control of algae and bacteria under various environments, in addition to scale and corrosion studies.

◆

▶▶▶ ELGIN SOFTENER CORPORATION, Elgin, Illinois, has opened an office in Appleton, Wisconsin, it was announced recently. The office, located at 215 N. Mason Street, will be in charge of Ralph H. Williams, who has been handling the Elgin line of water conditioning equipment in Wisconsin.

◆

WESTINGHOUSE "TIME CAPSULE" IS SEALED

Containing a record of our civilization, together with 40 articles of common use, the Time Capsule—a seven-foot metal cylinder—was sealed on September 23 for its 5,000-year journey to the future.

The Time Capsule was buried in a 50-foot well in front of the Westinghouse Building at the New York World's Fair exactly two years prior to the moment of sealing (Cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 768 Oct. 1938) and had been viewed since then through a periscope arrangement by over 4,000,000 fair visitors. Covered with pitch and other chemicals the time capsule will remain for future civilizations to discover.

The capsule is made of Cupaloy and was designed by a committee of engineers headed by M. W. Smith, manager of engineering at the Westinghouse company. Casting and precision machining of the capsule was done by expert craftsmen at the Westinghouse company's East Pittsburgh works.

◆

BAUSCH & LOMB OPERATING NEW CALCITE MINE

A new source of calcite, or Iceland spar, a valuable optical mineral heretofore imported from abroad, was revealed recently when officials of the Bausch & Lomb Optical Company, Rochester, New York, announced they had contracted for the output of a new mine in the San Pedro mountains, northwest of Santa Fe, New Mexico.

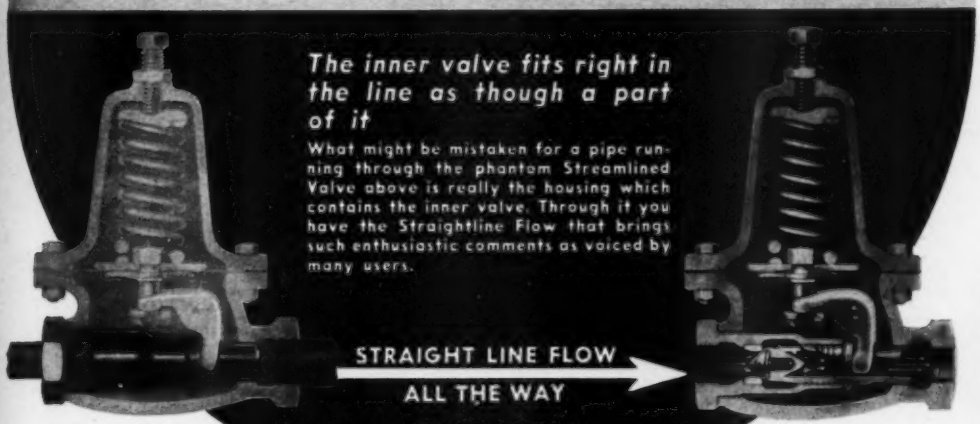
The discovery of this scarce material was made by a Mexican prospector. Further work by E. M. Stanton, a Chicago optometrist, led to a subsidy by Bausch & Lomb through which operations have been carried on. Formerly optical calcite was only obtainable from various countries, principally Spain and

Cooling systems in laboratories of D. W. Haering & Company.

"Speeded Up OPERATIONS ABOUT 20 TO 25%"

Note—SIMILAR RESULTS BEING EXPERIENCED BY WIDE VARIETY OF USERS

"We are glad to tell you that your Streamlined 1000-LP Valve has enabled us to speed up operation on our Hosiery Setting Machine about 20 to 25%. This is because your Valve gives such rapid action in bringing up the pressure and in holding the pressure constant during the preboarding operation."



The inner valve fits right in the line as though a part of it

What might be mistaken for a pipe running through the phantom Streamlined Valve above is really the housing which contains the inner valve. Through it you have the Straightline Flow that brings such enthusiastic comments as voiced by many users.

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE REDUCING VALVE

A valuable tool to help you speed operations, cut maintenance, save money

VALVE TURBULENCE ELIMINATED

The valve increases performance results by eliminating the ordinary valve turbulence indicated in illustration above. There is no detour around a dividing wall—the direction of flow is not changed at right angles because of a post wall—also, the flow is not broken up by valve stems, springs, or other parts.

REDUCED PRESSURE NEVER VARIES

You get Streamlined flow as indicated in illustration above. Because of this Streamlined flow and no turbulence, you are easily able to meet peak demand and yet hold the reduced pressure constant at the same time. You experience no spoilage results due to erratic pressure—because the reduced pressure never varies.

***Free* TRIAL** **Prove for yourself what others say about CASH STANDARD Streamlined Valves—do it at no cost—tell us to ship one to you on 30 days' free trial—after 30 days you get a bill—you either pay for it then or return valve to us at our expense—order one on trial today—see why there are no failures—decreased attention costs—no heat or chemical troubles.**

BULLETIN 1000 TELLS COMPLETE STORY

You may select a CASH STANDARD Streamlined Valve exactly suited for your service conditions. Bulletin 1000 shows how. Any combination of metals can be obtained for body, trim, valve seat, and seat ring. Handwheels for quick pressure adjustment also available.

IMPORTANT CHARTS SHOWN IN BULLETIN 1000

Steam, air, water capacity charts for all Streamlined Type 1000 Valves are shown in Bulletin 1000. These charts are easy to use—they enable you to determine precisely how much fluid any size Streamlined Valve will deliver under your exact pressure conditions—for steam, air (and other gases), water (and other liquids).

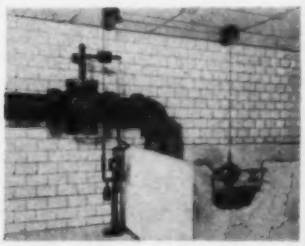
CASH STANDARD CONTROLS . . VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

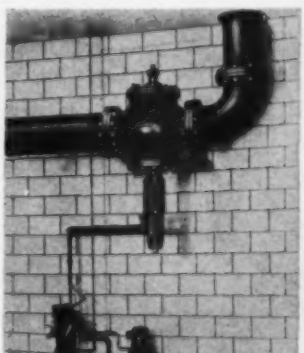
A CASH STANDARD "GET ACQUAINTED" COLUMN

Question: **"Don't you people make anything besides that Streamlined Valve you talk about so much?"**

Answer: **"Yes Sir; we do! And we propose to picture one or two of them here each time."**



In automatic liquid level control, two things are often of prime importance: (1) to hold the level within the closest kind of limits; (2) to do it dependably, day by day. How Cash Standard controls do both is shown above. A Type 100-L Controller operates a 12" Balanced Valve regulating liquid supply to a large tank. It is pilot actuated for sensitivity. It has operating power to spare—for any size Valve, however large.



Here, a Type 100-L Controller operates a 10" Cash Standard Balanced Valve. It regulates flow through a make-up line to a "dirty water" heater on the floor above. The lever of the "100-L" responds to slightest movement of a float in the heater—causing immediate movement of the power piston which operates the Valve. But there is no "hunting" because the Controller is fully compensated. It has a "range" adjustment too. It gets accurate results with any size valve—no matter how small or how large the valve may be. It is simply a matter of using the right size power cylinder.

Get Free Bulletins on Above . . . Write to A. W. CASH COMPANY DECATUR, ILL.

"Northern Hi-Lift Hoists *don't keep us up nights"...*

Maintenance Men Tell Us

● Maintenance men say that Northern Hoists stand all the shop can give them. They rarely have to work on them, and when they do, accessibility makes it easy.

Northern Hi-Lift Hoists are built to forestall maintenance. Liberal design—robust construction—welded rolled steel frame—machine cut, heat treated alloy steel gears—Hyatt Roller bearings. But when maintenance *is* needed, all parts are quickly accessible. Mechanical brake parts, for example, can be removed without removing the gear case. Electrical parts are all standard—easy to obtain.

Write for new Bulletin

NORTHERN ENGINEERING WORKS
2601 ATWATER ST. DETROIT, MICH.

CRANES *Northern* HOISTS

South Africa and then in meager quantities. The most important use of Iceland spar is for the manufacture of Nicol prisms, essential optical parts of polarizing microscopes, saccharimeters, colorimeters, polariscopes and other technical and research instruments.

◆

▶▶▶ THE APPOINTMENT of MacFarlane Foundry and Honolulu Iron Works, S. A., Sagua La Grande, Cuba, as boiler tube distributor for the Babcock & Wilcox Tube Company, was announced recently by the latter company.

◆

AMER. CYANAMID ADDS TWO UNITS AT KALAMAZOO

Two new units are being added to the American Cyanamid and Chemical Company plant at Kalamazoo, Michigan, it was announced recently. One of the new units will manufacture wax sizes for the paper industry under patents acquired from Bennett, Inc.; the other will prepare casein for use in coating paper.

Wax sizes have been made by Bennett, Inc., since 1927. The acquisition of the size business by American Cyanamid places all of the company's research and development group behind this product. The new casein plant at Kalamazoo will prepare this product of the dairy industry for use in paper mills. Raw casein from Wisconsin, Minnesota and the Pacific coast will be ground and blended in the new plant to provide a uniform product for paper coating.

◆

▶▶▶ LISTING OF THE common stock of the National Oil Products Company, Harrison, New Jersey, on the New York Stock Exchange has been announced by C. P. Gulick, president and chairman of the board. The stock has been listed on the Curb Exchange since June 24, 1936.

◆

▶▶▶ CANADIAN INDUSTRIES, LTD., has purchased a one-story concrete block warehouse in Toronto. The building, to be used by the chemicals division of the company for office storage and warehouse facilities, cost about $50,000.

◆

▶▶▶ A NEW LIQUID CAUSTIC PLANT to replace an obsolete unit is now being constructed by Canadian Industries, Ltd., according to a report. The new plant will cost around $80,000 including equipment.

▶▶▶ A MILLION-DOLLAR EXTENSION to the Peterborough (Ontario) plant of the Canadian General Electric Company, Ltd., is now under construction. The new plant, 800 feet x 160 feet, will serve the double purpose of providing additional capacity for service on Government contracts as well as for regular commercial products. This plant is used mainly for production of apparatus for generation and use of electric power, circuit breakers, switches, meters, wire and cable.

◆

GOODRICH CLAIMS NEW TYPE V-BELT

A V-belt which prevents accumulation of static and retains its static discharging qualities has been announced by the B. F. Goodrich Company, Akron, Ohio. The belt, which will be sold for the present to machine or equipment makers only is believed to be the first of its kind ever manufactured.

The Goodrich company points out that this new development is of the greatest importance to manufacturers and users of washing machines and other machinery where static discharges might create a fire hazard. One of the important features of the new V-belt is the absence of any danger of the belt acting as a "short" between the motor and its operator. The resistance built into the belt is just enough so that the belt itself cannot act as a direct passage for current.

◆

WESTINGHOUSE MEN TOUR SOUTH

In order to complete an "on the spot" economic survey of this country nine officials of the Westinghouse Electric and Manufacturing Company have been touring the South, visiting industrial, educational and power developments.

The purpose of the tour, according to A. W. Robertson, Westinghouse chairman and head of the group, is to "view at first hand the functioning of industry, agriculture and education in sustaining normal peacetime production while implementing the Government's preparedness program." "This information," he added, "will better equip Westinghouse to co-ordinate its efforts with other basic activities."

While on the tour, the men visited the site of the new Westinghouse offices, service plant and warehouse building in Atlanta, Georgia. This unit is to be completed by June. On three previous tours the Westinghouse executives visited states in New England and the East and seven states in the Middle West and Pacific coast district.

Identical

You couldn't tell them apart—and for good reason. A clever photographer has taken three pictures of one child and fitted them together to look like triplets.

All three tube problems (corrosion, oxidation and pressure) are resolved into one when you utilize the services of our tube experts. Think in terms of this one fundamental problem—tube expense—and we will show you how to establish the proper ratio of tube cost and tube life to effect the greatest possible economy.

TIMKEN Sicromo (resistant to oxidation and corrosion) and TIMKEN DM (resistant to pressure) tubes do the trick. They're intermediate in price and superior in performance. Consult us today.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

TIMKEN
SEAMLESS STEEL TUBES

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

S A F E T Y

WIS. BULLETIN GIVES PAPER MILL SAFETY RECORD

According to a bulletin of the Employers Mutual Liability Company of Wisconsin, the accident frequency for the pulp and paper manufacturing industry has not improved over last year. Figures reported by a representative number of firms, show that the accident frequency, which means number of accidents per million man-hours of work, increased by 1.9, meaning that paper mills had more accidents in the year ending July 1, 1940, than they had in the year ending July 1, 1939.

The bulletin adds that in spite of the slightly greater accident rate for paper and pulp manufacturing concerns as a whole, several of the large plants produced remarkably low accident frequencies for the year.

Among the outstanding plants which lead in the reduction of accidents are: Nekoosa-Edwards Paper Company, Nekoosa, Wisconsin, 1,268,320 man-hours, 4 accidents; Sterling Pulp & Paper Company, Eau Claire, Wisconsin, 687,408 man-hours, 1 accident; Riverside Paper Corporation, Appleton, Wisconsin, 342,228 man-hours, 1 accident; and the Wisconsin River Paper & Pulp Company, 342,050 man-hours, 1 accident.

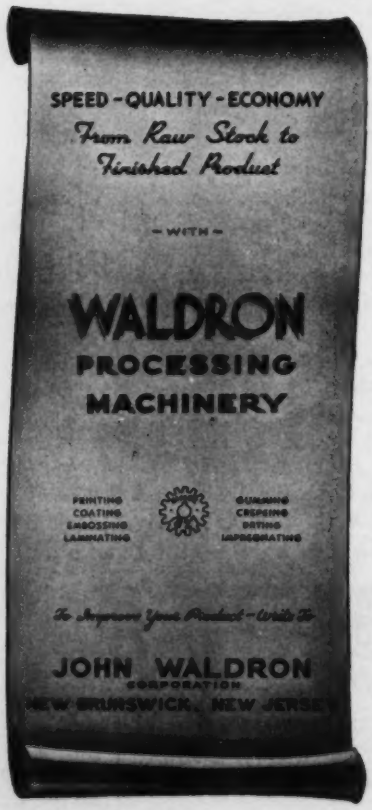
The report on the paper products industry is much the same as that of pulp and paper manufacturing, there being little difference in accident frequency between last year and this year. In the year ending July 1, 1939, the frequency was 12.9. In the year ending July 1, 1940, the frequency had only been reduced to 12.7, a negligible reduction.

Again, several concerns in the paper products industry produced very low accident frequencies in comparison to the frequency of the industry as a whole.

Some of the leaders in accident reduction are: Division A, the Hoberg Paper Mills, Green Bay, Wisconsin, 1 accident, 1,009,542 man-hours; Marathon Paper Mills, Menasha, Wisconsin, 11 accidents, 2,056,872 man-hours; Southern Kraft Corporation, Marinette, Wisconsin, 3 accidents, 911,243 man-hours; and the A. George Schulz Company, Milwaukee, Wisconsin, 2 accidents, 323,907 man-hours.

◆

▶▶▶ COMPANIES may have their name imprinted on the outside front cover of a rule book entitled "Safety Pays," which has been prepared by the National Safety Council for distribution to workers. These books are illustrated and the cost is small.



The Paper Industry Safety Contest

July 1, 1940 to June 30, 1941

Out of 185 mills reporting for August, 50 have perfect record

PERFECT SCORES

Division I—Pulp and Paper Mills

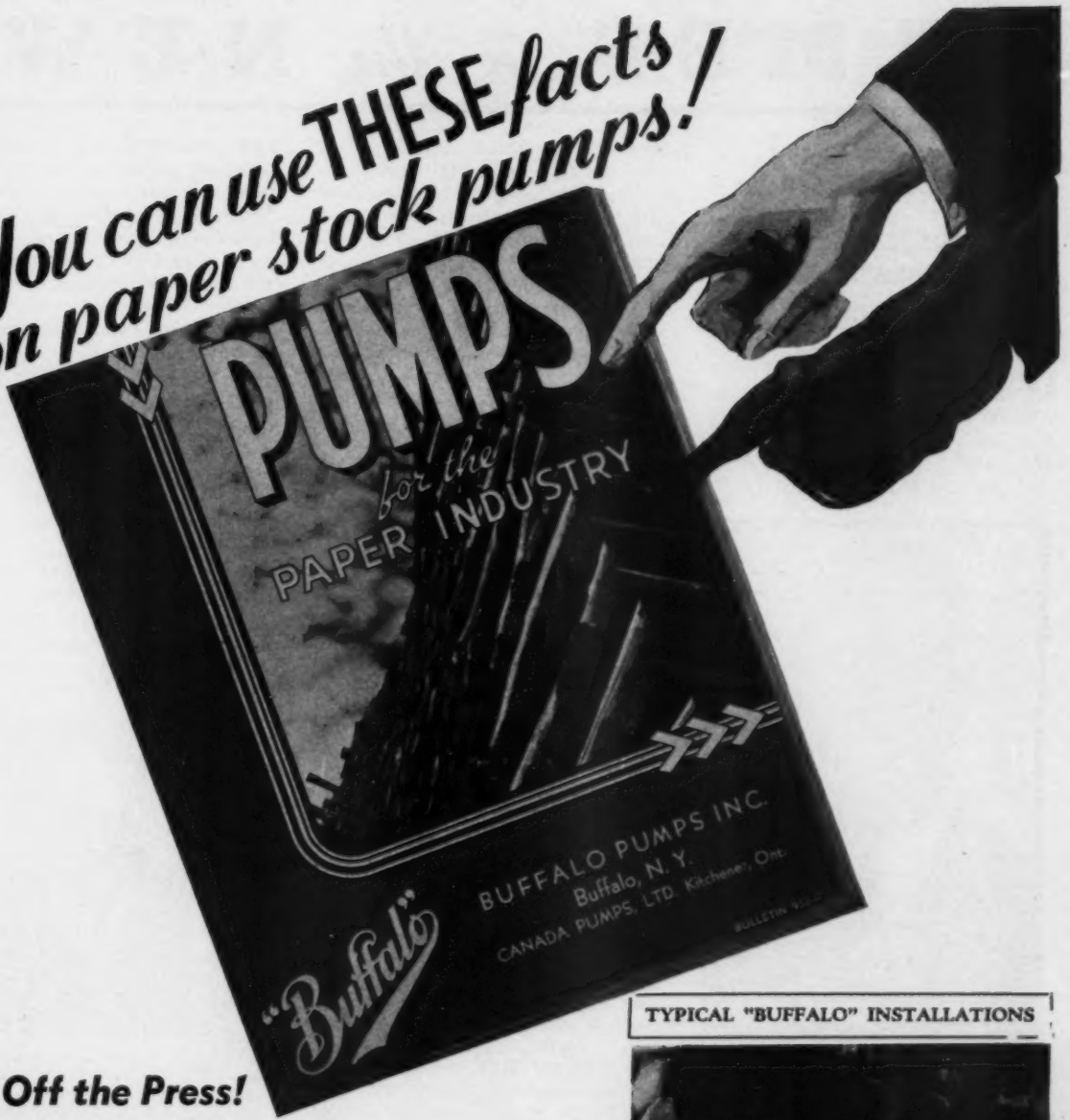
PARTICIPANT	MILL	LOCATION
GROUP A		
The Mead Corporation	Chillicothe	Ohio
Anglo-Canadian Pulp & Paper Mills, Ltd.	Quebec City, P. Q.	Canada
Consolidated Paper Corp., Ltd.	Port Alfred, P. Q.	Canada
The Flintkote Company	Pioneer Div.	Los Angeles, Cal.
GROUP B		
The Mead Corporation	Heald Div.	Lynchburg, Va.
P. H. Glatfelter Co.	Spring Grove	Pennsylvania
Crown Zellerbach Corp.	National Paper Products Co. Div.	Port Townsend, Wash.
Hoberg Paper Mills, Inc.	Division "A"	Green Bay, Wis.
Southern Kraft Corp.	Continental Div.	York Haven, Pa.
GROUP C		
Donohue Brothers, Ltd.	La Malbaie, P. Q.	Canada
Escanaba Paper Co.	Escanaba	Michigan
Cornell Wood Products Co.	Cornell	Wisconsin
Strathmore Paper Co.	West Springfield	Massachusetts
The Crystal Tissue Co.	Middletown	Ohio
Price Brothers & Co., Ltd.	Jonquiere, P. Q.	Canada
Strathmore Paper Company	Woronoco	Massachusetts
Finch, Pruyn and Co., Inc.	Glens Falls	New York
Rising Paper Company	Housatonic	Massachusetts
The Mead Corporation	The Harriman Co.	Harriman, Tenn.
*Central Fibre Products Co.	Quincy	Illinois
*Consolidated Water Power & Paper Co.	Appleton	Wisconsin
GROUP D		
American Writing Paper Corp.	Parsons Div.	Holyoke, Mass.
Bird & Son, Inc.	Phillipsdale	Rhode Island
Eaieeck Manufacturing Co.	Turners Falls	Massachusetts
American Asphalt Roof Corp.	East St. Louis	Illinois
United States Gypsum Co.	North Kansas City	Missouri
Spaulding Fibre Co., Inc.	Milton	New Hampshire
American Writing Paper Corp.	Mt. Tom Div.	Holyoke, Mass.
Rogers Fibre Co., Inc.	Fibreboard Mill—Div. 1	Bar Mills, Me.
Alton Box Board Company	Lafayette	Indiana
The Mead Corporation	Nashville	Tennessee
Hollingsworth & Whitney Co.	Abenaquis Mill	Madison, Me.
American Writing Paper Corp.	Gill Division	Holyoke, Mass.
*International Paper Co.	Livermore No. 11	Livermore Falls, Me.
Spaulding Fibre Company, Inc.	Hayes	New Hampshire
Central Fibre Products Co.	Mt. Carmel	Illinois
*Central Fibre Products Co.	Vincennes	Indiana
*International Paper Company	Riley No. 23	Riley, Me.
Division II—Paper and Board Re-Manufacturing		
Gaylord Container Corp.	St. Louis Container Plant	St. Louis, Mo.
Barber Asphalt Corp.	Madison	Illinois
Barber Asphalt Corp.	Barber	New Jersey
Bird & Son, Inc.	Chicago	Illinois
Kimberly-Clark Corp.	Atlas Mill	Appleton, Wis.
Container Corp. of America	Anderson	Indiana
Container Corp. of America	Cleveland	Ohio
Gaylord Container Corp.	Dallas	Texas
Bird & Son, Inc.	Shreveport	Louisiana
Gaylord Container Corp.	Houston	Texas
Bay West Paper Co.	Green Bay	Wisconsin
Container Corp. of America	Rock Island	Illinois

*August report missing—covers one month only.

For the first two months of the contest, frequency averaged 15.30, which was an increase of 19 per cent compared with July-August, 1939 average rate.

Twenty-three units have reports missing in this month's bulletin. The Council wishes to remind contestants that prompt reporting will mean a more accurate and interesting contest summary every month.

You can use THESE facts on paper stock pumps!



Just Off the Press!
Send for Your Copy Today

• Up-to-date facts and mechanical data on practically all types of pumps for the paper mill are at your finger tips in the *new* Buffalo Paper Stock Pump Bulletin 953-F.

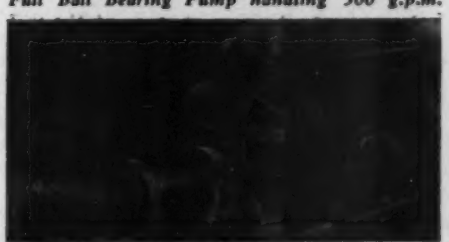
Send for your copy—and check into the proven features of "Buffalo" design and construction which are setting a new standard for efficiency and economy of operation.

BUFFALO PUMPS, INC.
213 MORTIMER ST. BUFFALO, N. Y.

Branch Engineering Offices in Principal Cities
Canada Pumps, Ltd., Kitchener, Ont.

TYPICAL "BUFFALO" INSTALLATIONS

Slurry pump installation. A No. 4 "Buffalo" Full Ball Bearing Pump handling 500 g.p.m.



"Buffalo" Double Suction Pump in a sulphite mill handling 1000 g.p.m. of white water against 105′ head.

ADVERTISING PAGES REMOVED

NAMES *in the* NEWS

Personals

CUNNINGHAM JOINS COLUMBIA ALKALI

Research chemist since 1930 with the Mathieson Alkali Works, Inc., Dr. G. L. Cunningham has joined the technical service department of the Columbia Alkali Corporation, chemical sales division of the Pittsburgh Plate Glass Company. At the same time it was announced that A. E. Daley has joined the sales staff and will operate as representative on less than carload sales of Columbia products in the Chicago area.

G. L. Cunningham

Dr. Cunningham is a graduate of the University of South Carolina and received his Ph. D. degree from the University of Virginia. Prior to 1930 he served as laboratory assistant at the University of South Carolina and taught chemistry at the University of Virginia. Mr. Daley was formerly associated with the Palmolive-Peet Company and A. C. Drury & Company.

◆

▶▶▶ A member of the engineering staff of the Leeds & Northrup Company since 1916, *W. Richison Schofield,* formerly chief engineer, has been appointed director of engineering for the Philadelphia firm. Mr. Schofield is an authority in pyrometry and automatic control. *John W. Harsch,* assistant chief engineer, has been advanced to chief engineer to succeed Mr. Schofield.

▶▶▶ *C. J. Gulick,* president and chairman of the board of the National Oil Products Company, Harrison, New Jersey, has been appointed to the resolutions committee and sponsoring committee of the National Association of Manufacturers. In the resolutions committee post, Mr. Gulick will be called upon to assist in the preparation of the 1940 Platform of Industry. The sponsoring committee is designed to rally support for private enterprise.

◆

▶▶▶ A remarkable success in obtaining increased contributions to the Community Fund has been shown by *Wesley M. Dixon,* vice president in charge of sales of the Container Corporation of America, and chairman of the Community Fund's Paper Division, Mr. Dixon heads a committee of 150 team captains and company representatives all working like the proverbial troopers in this worthy cause. He reports his division will show a substantial increase over last year.

◆

G. D. MUGGLETON SUCCEEDS MASSEY

Now general manager of the Combined Locks Paper Company, Combined Locks, Wisconsin, is G. D. Muggleton, formerly production superintendent at the Biron (Wisconsin) division of the Consolidated Water Power and Paper Company. Mr. Muggleton succeeds Peter Massey, former vice president and general manager at Combined Locks. The company, located near Appleton, Wisconsin, specializes in the production of lightweight printing papers. Mr. Muggleton takes over his new position after more than five years with Consolidated.

◆

▶▶▶ *Philip Toye,* who has been head of the New York office of the American Tissue Mills of Holyoke, Massachusetts, for the past three years is now sales manager of the company succeeding *Charles B. Brown.* Mr. Toye has been connected with American Tissue Mills for the past ten years.

◆

▶▶▶ *Neil H. Brown* has been appointed district representative for Copes feed water regulators, differential valves, pump governors and allied equipment of the Northern Equipment Company of Erie, Pennsylvania. Mr. Brown is now located in Charlotte, North Carolina.

▶▶▶ *Daniel E. Igo,* formerly associated with the Luckens Steel Company, is now connected with Graver Tank and Manufacturing Company, Inc., East Chicago, Indiana, in the capacity of sales and promotion manager. Mr. Igo will specialize in fabricated stainless and composite steels and will cover the Eastern territory for the Graver organization.

◆

▶▶▶ Associated with the American Cyanamid and Chemical Company since 1928, *Reginald M. Banks* has been appointed assistant to the president of the company to promote the co-ordination of research and sales activities. *Walter T. MacAdam* has been appointed to fill the post left vacant by Mr. Banks' promotion.

◆

▶▶▶ *G. Sinding Larsen,* chief engineer of the Pittsburgh Piping and Equipment Company since 1938, is now a director of the company it was announced recently. Mr. Larsen joined the Pittsburgh firm in 1924.

G. Sinding Larsen

◆

▶▶▶ *W. C. Starling* of the Hummel-Ross Fibre Corporation, Hopewell, Virginia, has been accepted as an approved Pulp Tester by the Certified Pulp Testers Bureau, it was announced recently.

◆

PERKIN MEDAL TO DR. DORR

Dr. J. V. N. Dorr has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1941. The medal, awarded annually for valuable work in applied chemistry, will be presented to the Dorr Company's founder on January 10.

Dr. Dorr was born in 1872. He received his B. S. degree from Rutgers

University, his M. E. and Doctor of Science degrees being conferred by the same institution. His many inventions include the Dorr classifier, the Dorr thickener, the Dorr agitator and the continuous counter decantation. He is at present the active head of The Dorr Company, Inc., which he organized.

◆

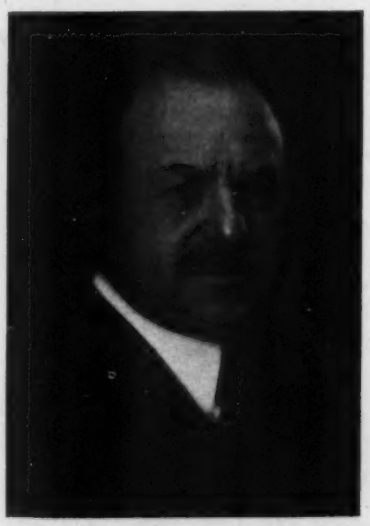
▶▶▶ As superintendent of the Crown Willamette Paper Company, Camas, Washington, *Gus Ostenson* succeeds his brother, the late Henry E. Ostenson (See Necrology).

Necrology

ERNST R. BEHREND

One of the best known figures in the nation's paper industry, Ernst Richard Behrend, president of the Hammermill Paper Company, passed away September 22 at his home near Erie, Pennsylvania. Mr. Behrend was 71 years of age and had been president of the Hammermill Paper Company since its inception in 1898.

Born in Germany in 1869, Mr. Behrend studied at technical institutes at Dresden and Charlottenburg, coming to the United States in 1896. His first position was that of draftsman and engineer with the Pusey and Jones Company, Wilmington, Delaware. In 1898, Mr. Behrend, with his father and brother, founded the Hammermill Paper Company. It was reputably the



Ernst R. Behrend

first all-sulphite mill in the United States devoted to the manufacture of writing papers.

In addition to pioneering in the manufacture of paper by the sulphite process, Mr. Behrend was the inventor of high speed watermarking and was among the first to use superheated steam. He also pioneered in the use of boiler feed-water purification.

Mr. Behrend became an American citizen in 1902 and took a very active part in civic affairs in Erie. In 1929, he was honored by the American Legion and became the only Erie citizen to receive the Legion's Distinguished Service Certificate. He was also a member of the American Society of Mechanical Engineers, the Board of Trustees of the Institute of Paper Chemistry at Appleton, Wisconsin, and a member of the board of trustees of Deerfield Academy, Deerfield, Massachusetts. He was one of the founders of the National Industrial Conference Board and was recently elected a vice president.

Mr. Behrend is survived by his widow, his daughter, a brother and a sister.

◆

▶▶▶ *V. Centennial Gledhill,* assistant superintendent of the Watson-Foster Wall Paper Company, Montreal, passed away on September 19 at the age of 64. He had been associated with the Foster Wall organization for forty years. Surviving Mr. Gledhill are his widow, a son and a daughter.

◆

W. R. ROBERSON

Willis R. Roberson, assistant to the director of operations at the Minnesota and Ontario Paper Company, passed away September 6 as a result of injuries suffered in an auto accident near Fort William, Ontario. Mr. Roberson was 38 years of age.

Mr. Roberson began his career in the paper mills at International Falls; became a machine tender and later became associated with the Abitibi organization at Iroquois Falls, the Fort William Pulp and Paper Company, the Great Lakes Paper Company and the Fort Frances and Kenora mills.

Surviving Mr. Roberson are his widow, a son and his parents.

◆

▶▶▶ *Dr. Edward C. Worden,* a leader in the cellulose chemistry field and head of the Worden Chemical Laboratory and Library, passed away September 22 at Millburn, New Jersey.

◆

▶▶▶ Former treasurer and a director of Louis Dejonge & Company, New York paper firm, *Charles I. McLaughlin* passed away September 24 at the age of 87. Mr. McLaughlin had been with the paper company for 59 years and at his death was a director of the Sunray Oil Company. His widow and a daughter survive him.

GEORGE N. ROBERTS

George N. Roberts, chairman of the board of Bemis Brothers Bag Company, with headquarters in Boston and paper mills at Peoria, Illinois, passed away September 15 in Newton, Massachusetts. He was 65 years old.

Mr. Roberts was born in Cambridge, Massachusetts, educated in the local schools and graduated from Harvard in 1897. He joined the Bemis organization in 1899, becoming treasurer in 1910. He was made president in 1934 and chairman of the board in February of this year.

Surviving Mr. Roberts are his two sons, two brothers and three sisters.

◆

▶▶▶ *Harold Hughes,* manager of the Far Eastern export department of Parsons & Whittemore, passed away September 16 after a short illness. He was 56 years of age and had been with the Robert Gair Company prior to his connection with Parsons & Whittemore.

◆

H. E. OSTENSON

Henry E. Ostenson, paper mill superintendent of the Crown Willamette Paper Company's plant at Camas, Washington, passed away September 9 in Seattle following an attack suffered while attending the national TAPPI Convention. Mr. Ostenson was fifty years of age.

Beginning work in the Camas plant in 1904, Mr. Ostenson worked up through various positions, becoming superintendent in 1929. His knowledge of papermaking, gained from experience and long study, made him an authority in the field.

H. E. Ostenson

Surviving Mr. Ostenson are his widow, a son and a daughter and his mother.

Convention Papers . . . Abridged

Materials of Construction For Kraft Pulp Mills— Third Progress Report

JAMES A. LEE, Managing Editor
Chemical and Metallurgical Engineering

The Materials of Construction Committee of the Technical Association of the Pulp and Paper Industry presents its third report covering practical experience with materials used for processing equipment in kraft pulp mills. Thirty-five mills kindly co-operated with the committee by supplying the information which is summarized in this report.

In general, this summary is believed to provide an accurate picture of what reasonably may be expected from the commonly used materials in kraft pulp processing equipment. It should also serve as a guide to those who are seeking more durable materials for certain units of processing equipment.

The pulp mills report a life up to 25 years for digester shells and an average of 13 years. Seventeen of the mills reporting state that their shells have become pitted. Several mills suggested that 18-8 chromium-nickel stainless steel would be most resistant to pitting.

In one instance the worn places in the digester caused by entering steam have been patched with 18-8 stainless steel with excellent results. In another mill a corroded and eroded digester has been repaired by spraying 18-8 stainless steel on the bottom and a patch on the side. After eight months the bottom appeared in good condition but the patch on the side had gone. It should be added that the spraying had been done by expert workmen.

Diffusers and wash pans are reported to have lasted up to 30 years. The average life has been 10 years. Twenty of the mills report pitting. Riveted diffusers generally show pitting around the rivets. Experience with welded diffusers is much more satisfactory than the riveted vessels.

Experience with the ordinary metals for diffusers and wash pans varies widely, as is the case with all equipment. Three mills have lined diffusers with 18-8 stainless steel, but their experience has as yet been too brief to determine whether this is the solution.

Eight mills report satisfactory results with ordinary steel perforated diffuser bottoms.

Fifteen mills report trouble with ordinary steel screens in diffuser bottoms, the trouble taking the form of buckling, mechanical wear, fatigue and corrosion, the last usually in the form of pitting and enlargement of holes.

Two mills have used Monel screens. Three 18-8 stainless steel perforated screens are in service.

Many mills report that they did not require materials other than ordinary iron and steel to prevent corrosion at the steam and liquor inlets and outlets on digesters. Thirteen report the satisfactory use of 18-8 and other stainless steels, principally for sleeves, nipples, and nozzle linings. Valves trimmed with 18-8 stainless steel containing molybdenum have been found to be satisfactory. A blow valve has been in continual use for four years and is still in good condition. 18-8 stainless steel nipples have been given good service for three years. One engineer has built up worn parts with Stellite. One mill mentioned the use of Monel metal for valve trim, while another reported the use of Monel for valve bodies and valve trim handling cooking liquor and black liquor. Among the other metals that are being used at the steam and liquor inlets and outlets are Inconel and copper-free Ni-Resist.

Twelve mills report corrosion trouble with digester sleeves. Several others report only wear.

There has been considerable variation in experience with the life of tubes in indirect heaters. In one mill plain steel lasted from 9 to 12 months; in another mill steel has a life of 18 months; in a third, steel has a life of two years; a fourth reports steel tubes go by cleaning after 15 years. The 18-8 stainless steels are in use in ten mills that reported. Monel tubes were mentioned as being used, but no information was given as to their life.

Eleven mills report no galvanic effects between corrosion resistant metal tubes and steel or iron shells and tube sheet; six did have trouble, while one had trouble when bronze or brass was used in valves. One reports scaling is most pronounced on 18-8 stainless steel when iron is present.

Seven of the mills have found that some tube materials scale more than others. Most of them report that plain steel scales more than does 18-8 stainless steel. Swedish iron and Monel are other metals that are favored over plain steel for tubes.

Nine mills have found a relationship between liquor composition and extent of scaling; several factors are said to be conductive to scaling; (1) strong alkali; (2) high silicate content; (3) high salt cake; (4) high soda ash; (5) high alumna; (6) using weak black liquor in digester reduces scaling; (7) long storage of white liquor helps.

Eleven mills have had corrosion or abrasion troubles with digester circulation pumps. The 18-8 stainless steels have been found to prevent this trouble by 13 mills.

Packings in centrifugal pumps handling hot alkaline liquors is one of the most universally encountered problems in the pulp mill. Some engineers report that they have not been able to secure a packing that will meet the requirements. Others report limited success with the various packings now available. Among these are: (1) soft asbestos graphited; (2) graphited flax; (3) long fiber asbestos; (4) Cutno; (5) Anchor 317; (6) Garlock 5278, 117, and 150; (7) Palmetto. The new spun mills. packing is being tried by several mills. One of these reports it satisfactory if the temperature is below 212 deg. F. This packing is in use in connection with concentrated black liquor.

The packing failures, one engineer contends, are due to improper application. He states that the packing should be cut in long tapers. These should be fitted on the shaft to knife blade spacing. Stagger the cuts and direction of cut in quarter turns.

Other engineers contend the trouble can be avoided by keeping the packing cool by a stream of water.

In the case of surface condensers used for condensing the blow-off steam from digesters as a means of recovering heat units by heating water, six mills have encountered corrosion effects on tubes, three have had corrosion of tube sheets, while only one reports trouble with shells.

The general survey included visits to a number of Southern kraft mills with particular reference to experience with tubes in black liquor evaporators. This survey yielded the following information concerning conditions that favor corrosion of steel tubes in these evaporators.

1) A combination of high liquor concentration and temperature: Most corrosion is experienced in the 1A and 1B bodies of the long tube vertical evaporators. The critical concentration seems to be around 40 per cent solids and critical temperature of the liquor around 220 deg. Fahr. Above these limits a short life of steel tubes may reasonably be expected.

2) The sulphidity of the cooking liquor: The higher the sulphidity of the cooking liquor, the greater is its corrosive effect. The reported sulphidity ranged from 23 per cent to 37 per cent on the active alkali with an average of 26 per cent.

3) The velocity of liquor flow through tubes: The velocity of the liquor appears to have a very important effect. The velocity in long tube vertical evaporators is higher than in horizontal tube evaporators where the liquor is outside the tubes.

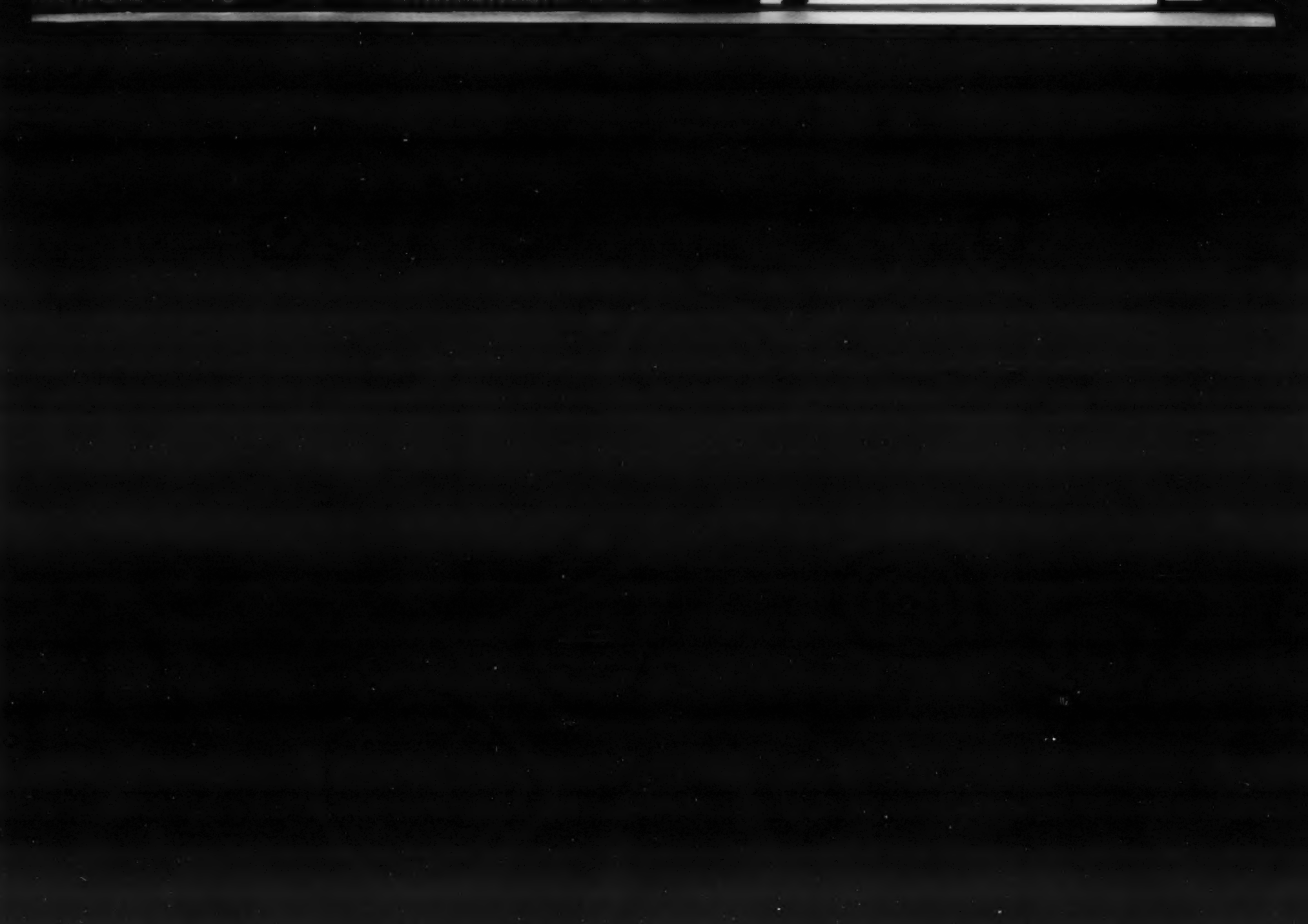
In forced circulation evaporators the high velocity coupled with the high temperature and high liquor concentration makes the use of stainless steel or equivalent allov tubes essential.

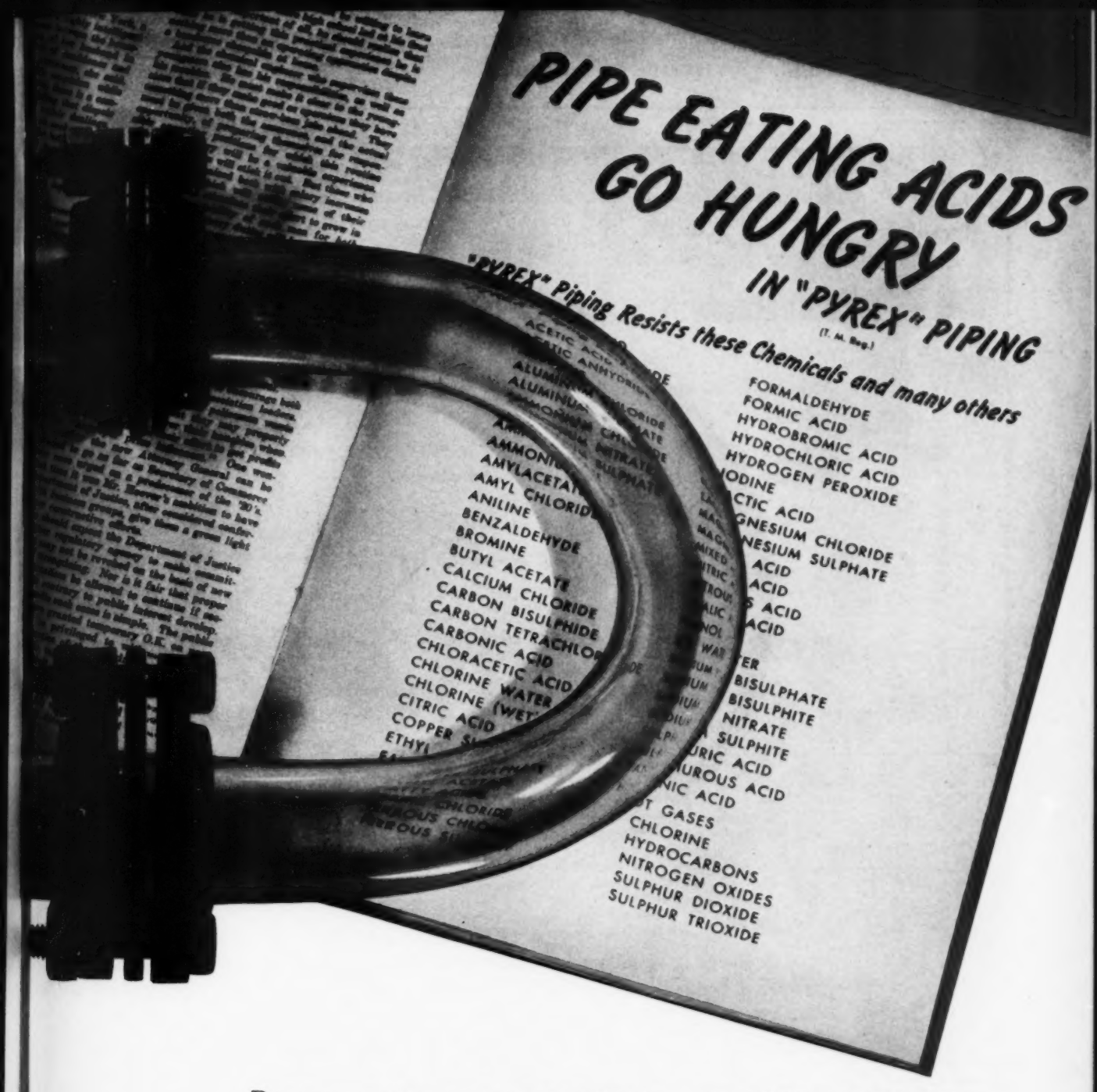
4) So far as vapor side corrosion is concerned, there is some evidence that vapors from weak liquors, especially at high temperatures, are more corrosive than vapors from the more concentrated liquors.

5) Scaling: When scaling is sufficient to protect tubes, it is bad from the heat transfer standpoint and is, therefore, not a desirable means of increasing tube life.

6) Galvanic Effects: Where 18-8 tubes have been used in mild steel tube sheets

Abridgments of papers presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, February 19-22, 1940, appeared in the March, April, May, June, August and September issues. Another installment is published this month.





PIPE-HUNGRY acids go on a starvation diet when you install "PYREX" Piping. The chemical stability of "PYREX" brand Industrial Glass bars their unwanted gnawing attacks on your conveying system, keeps them flowing smoothly on their way, uncontaminated. "PYREX" brand Industrial Glass is remarkably resistant to all acids and alkalies in solution (except HF).

This same resistance to corrosive attack insures permanence of the transparency that is a feature of "PYREX" brand Piping. Mechanical strength and unusual resistance to thermal shock add to its value in every industrial application. Let a Corning Engineer make a survey of your piping problems. Corning Glass Works, Corning, N. Y.

CORNING
Glass Works
Corning, New York

Pyrex Industrial Glass

"NON-USERS ARE THE LOSERS"

TENAX FELTS

FINISH AND SPEED

AMERICA SHOULDERS THE LOAD!

As available man-power is decreased, our machine-power must be increased. Now is the time to clothe your machines with TENAX FELTS. Assure yourself of many profitable hours of steady production over long periods of operation—we invite you to consult our engineers.

"Non-Users Are The Losers"

LOCKPORT FELT COMPANY

Newfane, N. Y. — U. S. A.

in concentrators and 1A and 1B bodies, there has been corrosion of the mild steel tube sheets around the 18-8 tube ends. It is desirable to use 18-8 or 18-8 covered tube sheets with 18-8 tubes.

7) Expansion Difficulties: There have been no difficulties with 18-8 tubes in mild steel evaporators on account of the greater thermal expansion of the 18-8 tubes. The reason for this is that in all cases where 18-8 tubes have been used in steel steam chests the bottom tube sheet has been floating to allow for expansion of the tubes.

The survey has demonstrated that the corrosion of black liquor evaporator tubes is the most troublesome problem of this nature in the mills. At the present time practically every mill visited is experimenting with the numerous metals and alloys that show any promise of resisting this severe service. Eventually, this mass attack on the problem must result in determining the best material or materials to use for evaporator tubes.

The 18-8 stainless steels easily won the vote as the type of material best suited to resist corrosion in evaporator tubes.

The KA_2SM is also being tried for this same purpose. Several mills report favorable results with Monel. The 3½ and 5 per cent nickel steels and 3 and 5 per cent chromium sheets are being tried in several mills. Seven mills have been employing ordinary steel with varying success. Many other alloys are in test, but sufficient data have not been obtained as yet to determine their usefulness.

Suggestions for the prevention of scaling include the following: (1) highly polished steel surfaces, (2) low salt cake stock and rosin-free liquor.

For the washing of kraft pulp on vacuum filters, Monel is most often accepted as the most satisfactory material for the wire cloth, although 18-8 stainless steel and nickel wire are also favored.

Numerous materials are being used to convey vapors given off from contaminated condensate leaving evaporators or from vapors exuding from concentrated liquor tanks, diffusers, smelter furnaces, and the like.

When pumping liquids containing abrasives in suspension (such as in lime sludge), as in recausticizing service, all but two mills indicate a preference for open impellers, purely from the standpoint of impeller life without regard to pumping efficiency. In one case the engineer reporting has no preference between open and closed impellers, while another reports a closed impeller has given excellent service.

Fifteen of the mills have found cast iron best suited for use in such pumps. In one of these cases the shells and impellers are cast iron while the shafts are made of Monel. Another uses manganese steel or high-silicon iron depending upon the nature of the service. A 3 per cent nickel cast iron and a cast iron containing Si 1.9; Mn, 0.7; S, 0.005; P, 0.43; C, 3; Ni, 1 are also in use.

Two mills prefer cast steel; one, manganese steel; six, plain steel; eight, 18-8 stainless steel; one, Cataract metal (a Cu-Ni alloy); and one, Monel with shafts of 18-8 stainless plus molybdenum or Monel and 5 per cent chromium steel.

Nineteen mills are using unlined steel tanks for slaking lime, one uses steel lined with tile, one prefers a fire brick lining (which lasts indefinitely according to the report), five use a concrete lining, while another recommends stainless steel.

For refractory linings of smelter furnaces, soapstone is a two to one choice over chrome brick. Special comments were as follows: (1) soapstone in secondary zone, chrome in primary for Wagner, (2) chrome in smelter zone and No. 1 fire brick in combustion chamber and rotary, (3) chrome brick for top hole, (4) chrome brick wall in bottom, well insulated, soapstone or very dense fire brick upper section, (5) soapstone if not water cooled.

Protective coatings have come in for more attention in the bleach plants, but they are beginning to be used to some extent in the pulp mill for other purposes than protection against bleaching reagents.

The kraft pulp mills of the country are using a wide variety of piping material for handling cooking liquors, milk of lime, and other solutions. Plain iron is most generally employed for the milk of lime, but low chromium-nickel steel is favored by most engineers for handling cooking liquor, green liquor, and black liquor.

An effort was made to obtain information covering experience of the mills that are bleaching sulphate pulp. Seven mills contributed to the survey.

Experience differs with chlorinating vessels made of concrete and lined with tile plates.

From a corrosion point of view if the

Here's cheap Insurance Against Costly Air Leaks!

NO. 7 OF A SERIES

LUNKENHEIMER

LUNKENHEIMER
AIR CONTROL DEVICES
. . . ARE CORRECTLY ENGINEREED TO SHUT OFF TIGHT AND PREVENT LEAKAGE

● On compressed air lines, even the smallest leaks add up to substantial losses at the end of a year. That's why Lunkenheimer has seen to it that among its many different lines of correctly engineered valves for every purpose, there's one which includes a complete selection of air control devices designed to keep such lines absolutely tight.

Included in this line are air cocks, air nozzles, globe, check and quick operating valves, and pop safety valves. Characterized by simplicity of design, many with renewable parts to eliminate costly replacements, and including features of construction which assure not only tight closure, but easy operation as well, here is a sure way to end air wastage, with resultant lower operating costs.

SEEING IS BELIEVING!

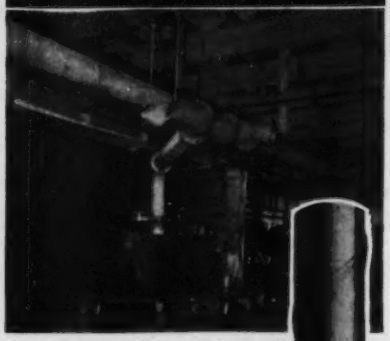
First, let our distributor point out the same visible features of design and construction, typical of all Lunkenheimer products, which assure better and more economical service. Then, once installed, the total absence of air leakage will surely confirm every claim we've ever made for these money-saving air control devices.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
—"QUALITY"—
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT 310-332 HUDSON ST., NEW YORK

Send for the new Catalog 78, describing the entire line of air devices and we'll include our handy "Guide" which facilitates selection of all Lunkenheimer products according to pressure, temperature, and service applications.

14-7A-67

Not how HEAVY
..but how STRONG



— that's the real "measure" of pipe

THE spiral reinforcing seam of Taylor Forge light wall pipe has given it resistance to bursting, collapsing and other stresses equal to that of wrought pipe of twice its weight.

Cutting weight in half saves on handling and shipping charges—cuts installed cost in half. This means that the more jobs you find for this modern, efficient pipe in your plant, the more you can save. A complete line of lightweight, streamlined fittings, plus the Taylor Forge Special Fabricating Service, adapts Taylor Spiral Pipe into the most intricate layout.

Write for Catalog 404

TAYLOR FORGE & PIPE WORKS

General Office & Works:
Chicago, P.O. Box 485
New York Office: 30 Church St.
Philadelphia Office:
Broad Street Station Bldg.

TAYLOR Spiral PIPE

vessel is to be used only for chlorination or for chlorination and neutralization, it is recommended that it be made of tile lined concrete, rubber covered steel, wood, or steel protected by chlorinated rubber base paint with rubber covering above the water line.

Rubber covered steel is recommended by three mills for impellers in chlorinators. Other mills prefer straight 18-8 stainless steel and the steel containing molybdenum. Durimet is said by another report to be very satisfactory after two years.

Where chlorine gas is fed directly to the chlorinator, rubber covered steel and Hasteloy C have proved most resistant to corrosion when used as a diffuser.

Various materials are recommended for lead in pipe for chlorinator—Pyrex glass, glass-lined steel, lead, rubber-covered steel and others.

Where chlorine is fed in water solution to the chlorinator rubber-covered steel has proved most resistant and longest lived for carrying the water-chlorine mixture.

Hasteloy C, high silicon iron and KA_2SM_0 (must be annealed after mechanically working) are recommended as best material for the ejector.

The materials that have proved most satisfactory for dump valves of chlorinators where the stock is dumped acid are: rubber-covered steel, stainless steel, Durimet. Where the stock is dumped KA_2SM_0 acid resistant bronze and Durimet are recommended.

The materials that have proved most satisfactory for stock pipes (welded, cast, lock, seam) when dumped neutral are: steel and wood-lined steel.

The material best suited for stock pumps where the stock is pumped acid is reported to be high-silicon iron; where it is pumped neutral, KA_2SM_0, cast iron.

Monel metal and KA_2SM_0 are reported satisfactory for washers when stock is washed acid. The former is reported as having lasted three months and the latter one year. Where the stock is washed alkaline or neutral, Monel wire is reported as lasting 12 to 18 months, bronze as lasting six months, stainless steel still good after two years.

In the process of caustic extraction, the materials that are reported best for the extractor are: reinforced concrete with tile lining, cast iron, alkali tile (Stebbins), and stainless steel.

Materials reported as giving best results for bleach liquor make up and storage tanks are: concrete (one mill specifies that surfaces be well towelled), steel painted with chlorinated rubber base paint, hollow tile.

In the case of materials for handling milk of lime, five mills prefer plain cast iron for piping; one prefers steel and one wrought iron. All seven prefer cast iron for pumps, one of these finds a 3 per cent nickel iron best for casing and impeller. Four mills like steel for the slaking tank and one reports iron satisfactory.

The steel framework in the bleach building is protected by several types of paints. Iron oxide primer is still good after one year. Aluminum paint is used satisfactorily. White lead is used in another mill, but it is stated that chlorinated rubber base paint is better. In a fourth mill chlorinated rubber base paint is used on all framework and equipment with complete satisfaction.

Both plug and diaphragm types of valve have been found to be effective and long lived for handling bleach liquor. The metals recommended are: 3 per cent nickel cast iron or CNI body with trim of KA_2SM_0 and high silicon iron.

The special treatments that have been effective in combatting corrosion in and around the bleach plant are: Heresite, chlorinated rubber base paint, S.D.O. Asphalt paint, lead covering. The chlorinated base paint is strongly favored by almost every engineer that has anything to do with a bleach plant. Several of the mills also advocate ventilating the building to remove the chlorine fumes as quickly as possible. All equipment should be hooded and vented to the outside, including washers, cells, and other equipment.

The bleach liquor (hypochlorite) is measured by a measuring tank in most mills. Another mill uses a Monel orifice with a constant head. In still another mill a Rotometer is used for measuring the bleach liquor.

Microbiology of Pulp and White-Water Systems

H. K. NASON, R. S. SHUMARD, and JOHN D. FLEMING
Research Department, Monsanto Chemical Company

All pulp and white water systems contain an abundance of food in a form readily available to micro-organisms. Small amounts, in the form of mineral salts and soluble organic substances, may be furnished by the water supply. By far the largest amounts, however, are furnished by the stock. Thus, wood pulp furnishes large amounts of water-soluble substances, such as mineral salts, sugars, extractives, etc., starches and similar colloidal substances, and cellulose. The first two of these groups are rich sources of food for most micro-organisms, and even cellulose can be broken down and utilized by some bacteria and fungi.

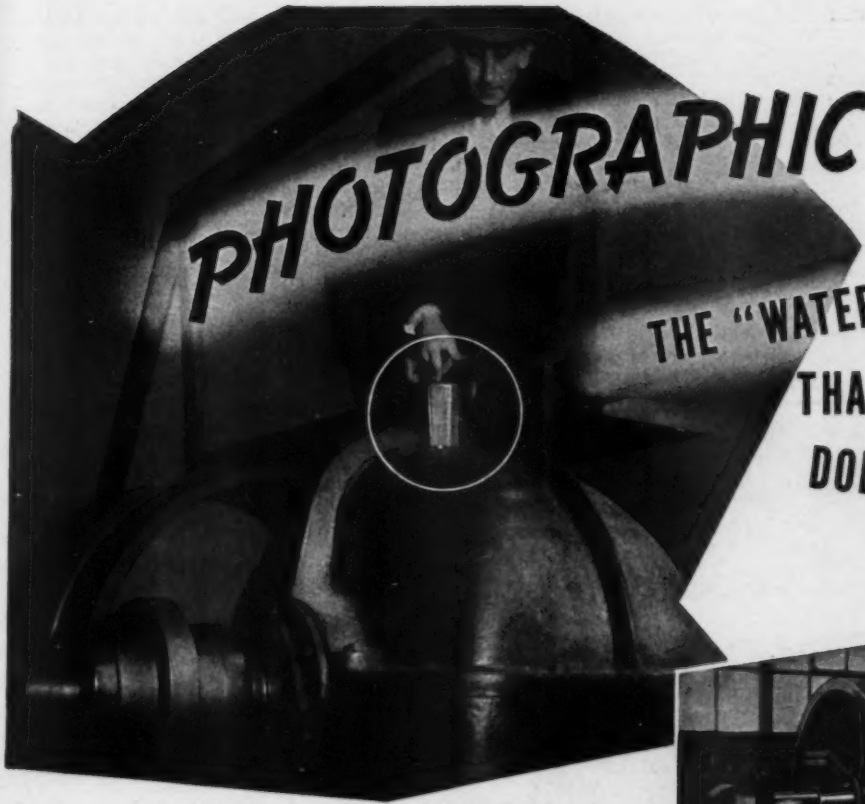
It is true that the relative types and amounts of food substances may vary greatly from one paper-making system to another. Ground wood systems are generally richest in these materials. Straw-board systems also contain a very plentiful supply. Sulphite or rag stock systems may be relatively poor in such food materials, but nearly always contain enough to permit bacterial growth.

Bacterial growth is most abundant where an excess of liquid water is present, and bacterial slime is most abundant in those parts of the system which are completely submerged or nearly so.

Fungi, on the other hand, prefer locations which are moist, but not excessively wet. Fungi grow well on equipment just above the water line, on stored lap pulp, etc. Paper will support fungal growth when its moisture content is 25 per cent or higher but not when completely submerged.

Air is usually present in pulp and paper systems, and most of the organisms responsible for paper mill difficulties are aerobic.

White-water systems are nearly always maintained at temperatures which are very favorable for the growth of micro-organisms. Temperature conditions in warehouses where lap pulp is stored are also favorable, particularly for fungal growth. Low winter



PHOTOGRAPHIC PROOF

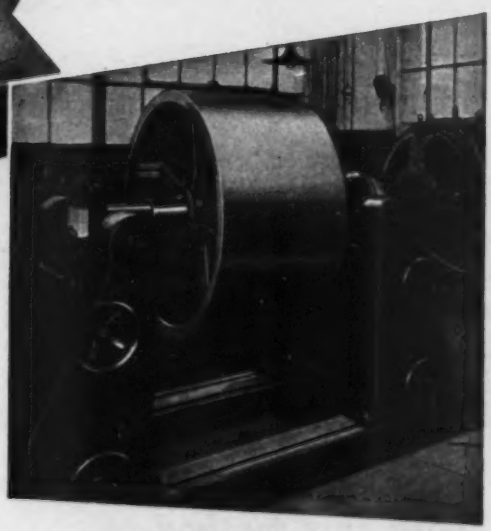
THE "WATER TEST" SHOWS THAT THIS DRIVE DOES NOT VIBRATE

In a recent demonstration, a brim-full glass of water was set on a Black-Clawson spiral bevel gear drive . . . a drive that had been operating continuously without repairs for almost eleven years.

Not a drop of water was spilled . . . not a ripple was created . . . even though this veteran drive was running at top speed and glass was on sloping surface.

Get this kind of vibrationless performance by installing Black-Clawson drives in your mill. Avoid repairs and other losses that come through operation of chattering, old-style drives.

Send in your list of worn-out drives. Without obligation on your part, we will make an estimate of their replacement cost. **The Black-Clawson Co., Hamilton, Ohio. Operators of Shartle Brothers, Middletown, Ohio.**



Balancing Machine . . . B-C drives are both statically and dynamically balanced for vibrationless performance. And before any B-C drive leaves our shop, it must pass rigid tests.

Black-Clawson

SPIRAL BEVEL GEAR DRIVES

temperatures may restrict growth somewhat during part of the storage season.

Every pulp and paper system is amply inoculated. The contaminating organisms come in with the stock and water used. The air and all equipment, as well as size and other added materials, furnish further contamination at various points throughout the process.

Some slime-prevention methods have as their prime objective the removal or elimination of sources of contamination. This applies to chlorination of the raw water used and to periodic cleaning of the paper machine and accessory equipment.

Bacteria generally prefer media whose *p*H is within the range 6.5 to 8.0. Fungi, while usually growing most luxuriantly at or near this neutral range, can grow at much higher acidities and may be found on materials whose *p*H is as low as 2.0 or even lower.

Light is comparatively unimportant in paper mill systems. Only the algae, of all the organisms present, require light and they are rarely present in these systems.

Some attempts have been made to utilize ultra violet rays for the sterilization of finished paper, but these have met with little success.

Slime usually occurs below the water level but "spatter" slime, which forms at or above the water line is not uncommon.

Under favorable conditions, large quantities of slime may form in a relatively short time.

There are a great many different kinds of micro-organisms, including bacteria, fungi, yeasts, algae and protozos, which may be encountered in slime deposits. The composition of such deposits varies widely from mill to mill and even from place to place in the single group of slime-forming organisms. Fungi, while frequently of importance in spatter slime, are but occasionally encountered in submerged slime and usually are relatively unimportant, since they do not ordinarily grow well when completely submerged.

Probably the most important of the slime-forming bacteria are the capsulated bacilli. These occur as small rod-shaped organisms which are surrounded by a heavy, gelatinous, slimy coating or capsule. This capsule, which is usually pectinaceous in nature, swells in water to produce a heavy, viscid mass. These organisms utilize sugars in their metabolism and produce acids as waste products. Some have been reported to have the ability to digest and utilize cellulose, but this point is disputed.

In addition to the rod-shaped bacteria, the cocci or ball-shaped forms are sometimes encountered and may be of importance in some cases.

The iron bacteria constitute another important class of organisms which may be present in slime. These are generally filamentous bacteria which secrete iron oxide, or hydroxide in their sheath. They may produce masses of gelatinous slime and are frequently the cause of brown rust spots in finished paper.

A similar group of organisms is the sulphur bacteria. These deposit sulphur granules within the cell.

Relatively few yeasts have been implicated as causative agents for slime deposits, but some forms, especially those resembling capsulated bacteria, are contributing, if not primary, causes in some cases.

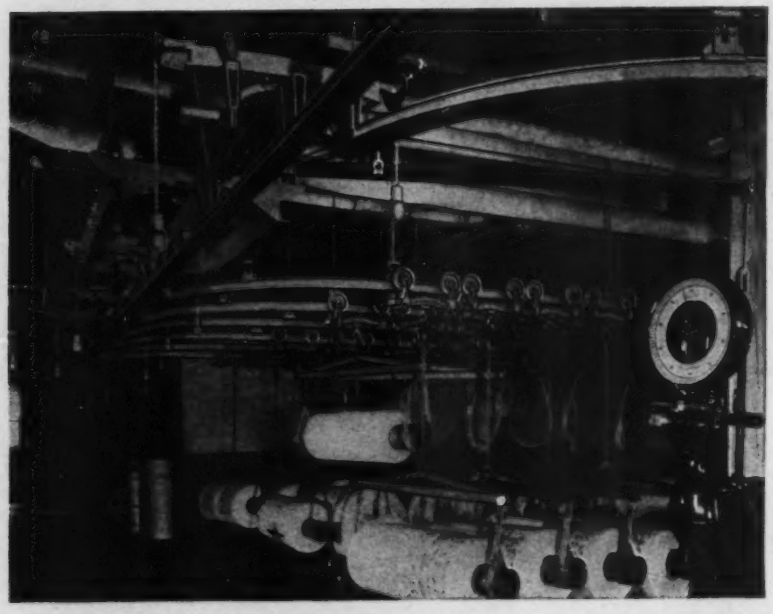
Algae have been isolated occasionally from slimes, but in most cases their presence seems to be without causative significance. Algae do cause extensive slimy deposits in cooling water systems, and may in some cases be of importance to paper mill operators.

Protozos are not important organisms from the standpoint of slime formation.

Chemical or mechanical pulp is frequently stored damp for long periods of time and under the usual storage conditions considerable damage is suffered from the attack of micro-organisms.

Bacteria usually do not thrive on stored pulp because of its relatively low moisture content, but fungi find these conditions ideal and grow vigorously. Bacteria, when present, are generally found in the lower sections of the piles, where moisture is most abundant.

Although in general, damage to stored pulp by the action of bacteria is slight, fungi, which grow under conditions of moisture, temperature and acidity detrimental to bacteria, cause serious damage. These fungi may be divided into three groups: (1) those which cause rotting, (2) those which cause staining, and (3) those which cause speck formation. It is the general practice to combat slime by regular clean-ups at semi-annual, monthly, semi-monthly or weekly period depending on the seriousness of the condition. Many mills



Eliminate Damage Losses—Cut Costs with this method of

WAX PAPER HANDLING

Damage caused by "slam-bang" methods of hand-handling rolls of wax paper runs costs up and seriously nicks the profit column.

Easy operating Cleveland Tramrail eliminates damage losses—and in addition reduces handling time and increases storage capacity.

The system illustrated handles paper to winder, printer, waxing machines and storage. Scale incorporated in track makes weighing easy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1165 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

QUALITY · SERVICE
DEPENDABILITY

APPLETON FELTS

make good
PAPER

Today Appleton Felts are standard for quality, service, finish, uniformity, design—and dependability. Look for our trade mark on your felts. It's your assurance of service and dependability—that the felts were designed to meet your mill requirements.

Appleton Woolen Mills

APPLETON • WISCONSIN

supplement weekly wash-up measures with continuous anti-slime treatments.

Slime formation in pulp and paper systems is prevented or greatly reduced in many mills by the application of chlorine or chlorine with ammonia to the fresh water supply, the shower water or the white-water and sometimes by treatment at all of these places. The average chlorine dosage used varies from 0.6 to 1.0 pound per ton of product.

Copper sulphate, zinc sulphate, acids, caustic alkalies, combinations of chlorine with copper sulphate and chlorine with ammonia and the copper sulphate are sometimes used to combat slime but the results achieved are not consistently satisfactory.

The development of synthetic organic fungicides has provided new and economical materials in the polychlorphenols which are proving very effective agents for both the control of slime and the preservation of stored pulps. Sodium pentachlorphenate is believed to be the most suitable and effective of these agents now commercially available.

Some mills have found it may be applied by continuous feed at the grinders in dosages of from 0.1 to 0.6 pound per ton of pulp ground, and the inhibition of organism growth will persist throughout the pulp and paper systems.

The rotting, staining, and specking of both chemical and mechanical pulps during damp storage can be prevented by the incorporation of from two to four pounds of sodium pentachlorphenate per ton of pulp (dry basis). This may be accomplished by spraying a solution of the chemical on the lap while being formed on the wet machine.

Many other useful applications for sodium pentachlorphenate are being found in the pulp and paper industry, not only by reason of its high degree of toxicity to a wide range of trouble-making organisms but also because the physical and chemical properties of the material, such as stability, non-corrosiveness, low vapor pressure, freedom from odor, etc., make it particularly well suited to the processes of manufacture and the requirements of the finished product.

Reduction of bacterial count and mildew-proofing of paper and boxboard can be obtained by incorporation of sodium pentachlorphenate into the stock in the beaters. Insoluble pentachlorphenol, precipitated on the fiber by the action of alum or other acidic elements on the water soluble sodium salt, is retained in the finished sheet. The concentrations required for these purposes depend upon the characteristics of the stock and range from 0.06 to 0.5 per cent of the weight of the dry fiber.

Sodium pentachlorphenate is also being used to preserve felts against biological rotting by rinsing with a weak solution of the chemical before shutting down. Stocks in process and held over during the shut-down period may be prevented from souring or putrefying by the addition of about five pounds of sodium pentachlorphenate per ton of dry fiber present.

Manufacturing and technological experience to date with sodium pentachlorphenate, as well as published toxicological data, show that sodium pentachlorphenate is no more toxic to man than many other chemicals in common industrial use today.

Dimensional Changes In Paper

H. W. BIALKOWSKY[1] and T. R. PROBST[2]

The expansion and contraction of paper with changes in moisture content, caused either by humidity changes or actual wetting, has been recognized for a long time as one of its fundamental properties.

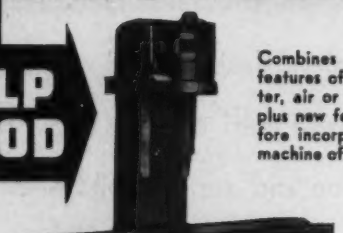
The magnitude of the expansion caused by actual immersion of a simple strip agrees fairly well in the literature, but those dimensional changes caused by relative humidity changes are difficult to compare because of the different procedures used by the various investigators. In an attempt to simplify and standardize, the present work involves the measurement of dimensional changes with changes in relative humidity starting at 50 per cent, raising to 95 per cent, and then lowering to 15 per cent. This range would almost cover the extremes encountered when papers are used commercially and should give some practical data upon the ordinary dimensional changes to be encountered in actual use.

The Relative Humidity—Dimensional Change Apparatus.

Sample holders were made so that the strips would be about 25 cm. long, would lie horizontally and would be held taut by small weights attached to the ends of the strips. The weights had a mass of 32 grams and hung in a vertical position. Two sample holders were placed in tandem in glass tubes having a diameter of 1.85 inches.

(1) Technical director; (2) Chemist, Gilbert Paper Company.

A New Idea in KNOT DRILLS for PULP WOOD



Combines all the desirable features of a mechanical, water, air or steam driven drill, plus new features not heretofore incorporated into any machine of this type.

No pipe line connections in this Knot drill.

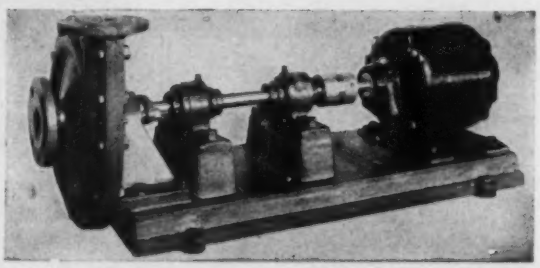
Flexible in operation . . . instantly adjustable to the top working speed of operator . . . faster . . . self-contained . . . positive in action . . . sturdy construction.

DOUBLE OR SINGLE HEAD WOOD CLEANERS

Designed to clean slabs and edgings, and can be used at the sorting or cleaning table at the discharge of barking drum to clean round wood by removing knots and patches of dirt bark. Some mills use them to remove broomed ends in groundwood operation.

Write for complete details on these units or any Murray woodroom and cleaning equipment.

D. J. MURRAY MANUFACTURING CO.
WAUSAU • WISCONSIN



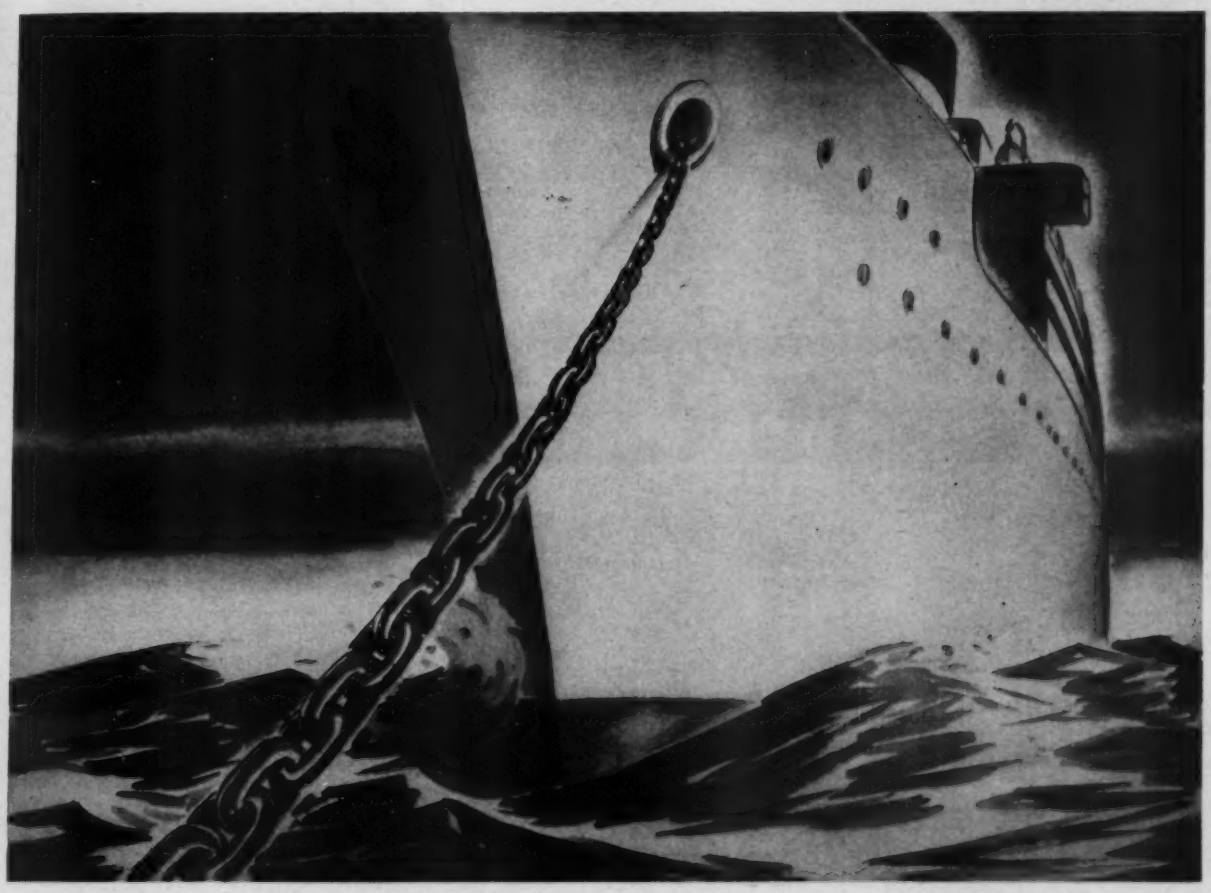
WHAT'S YOUR PUMPING COST?

It's the cost per gallon pumped—not the cost of the pump itself—which counts in the long run. With a LAWRENCE CENTRIFUGAL built for your special conditions, you'll secure the lowest pumping costs. And you will pay no more for a LAWRENCE CENTRIFUGAL than for another pump less carefully engineered to give you the service you seek. Let us discuss pumping costs with you.

LAWRENCE MACHINE and PUMP CORP'N
367 Market Street LAWRENCE, MASS.

LAWRENCE CENTRIFUGAL PUMPS

OPACITY • WHITENESS • BRIGHTNESS



TITANOX Is Like a Strong Chain that Holds a Ship to Safe Anchorage

WHEN we speak of TITANOX, we refer not only to the pigment, but also to the tangible and intangible benefits derived from its use. Each benefit is a link in the cable that joins pigment producer and paper maker with a bond that makes for satisfaction and success. Let us picture the various links.

The anchor is the manufacturer, big and sturdy, that will not drag in any weather. From it start the links of uniformity, quality and adaptability, which represent production. Then follow the links of sales, delivery and availability which have to do with keeping customers supplied with required pigment.

Qualified salesmen, technical service and help in practical utilization form the next group of links, marking the cooperation between pigment producer and consumer. Finally there are the links of progressive company policy as represented by the service laboratories and research laboratories.

Every link in this TITANOX chain is sound and strong. We offer it to makers of all types of paper.

TITANIUM PIGMENT CORPORATION, *Sole Sales Agent*
111 Broadway, New York, N. Y.; 104 South Michigan Avenue, Chicago, Illinois;
National Lead Co. (Pacific Coast Branch), 2240 24th Street, San Francisco, California

TITANOX
TRADE MARK

The ends of the tubes were closed by means of rubber stoppers, and were joined in series by rubber tubing. Series connections were used instead of parallel in order to obviate any short-circuiting of the air flow.

The whole series of tubes were mounted upon a wooden frame over which a piece of plate glass was placed. Then, the sample strips could be observed by means of a Central Scientific Company measuring microscope.

Since the whole apparatus was assembled in a constant humidity (50 per cent), constant temperature (76 deg. Fahr. room, the temperature of the saturated solutions was constant and, therefore, the relative humidity of the air from each set of solutions was always the same.

The procedure used was first to humidify the paper samples in question so that they were in equilibrium with the 50 per cent relative humidity and 76 deg. Fahr. of the humidity room. Strips 15 mm. wide were then cut in the proper direction and were inserted on the sample holders. After the weights had been screwed on the part of the strip hanging over the end, a line was carefully drawn coinciding with the line on the sample holder which marked off exactly 20 cm. from the clip holder. The prepared holders were then inserted in the glass tubes so that check samples were placed in different tubes. The rubber stoppers were inserted in the ends of the glass tubes; the tubes were connected in series and then air of 95 per cent relative humidity was passed through until equilibrium had been attained. The microscope was then placed upon the covering glass plate, and the elongation from the reference point was measured. Similarly, then, the air was shifted to the dry side of the setup so that air of 15 per cent relative humidity was supplied and another period was allowed for equilibrium to be reached, and the shrinkage from the reference point was measured for twenty samples.

The accuracy of measurement was ±0.001 cm. or 0.1 per cent, and the humidity could easily be determined to ±1 per cent.

The Immersion—Dimensional Change Apparatus.

Brass holders were prepared for this method. Samples 1.5 cm. wide and 17 cm. long were clamped in place, and a line coinciding with a permanent mark on the holder for a distance of 10 cm. was drawn on the sample. Once again small weights were screwed on the end of the strip to hold the paper taut. Then the strip was immersed for one minute in water at 25 deg. C., and the expansion measured by means of the same measuring microscope mentioned before. This method was also carried out in the constant humidity room.

Papers from all sulphite to all rag content and ranging in folio basis weight from 9 lb. to 47 lb. were investigated. Over this wide range of weights, from 15 per cent to 95 per cent relative humidity, the change in dimensions in the machine direction averaged 0.58 per cent, while in the cross direction the change averaged 1.62 per cent.

A most interesting fact was found when the expansion caused by raising the relative humidity from 50 per cent to 95 per cent was compared to the shrinkage incurred when the relative humidity was lowered from 50 per cent to 15 per cent. Average results are shown below.

	50%-95% R. H. Expansion –%	50%-15% R.H. Contraction –%
Machine Direction	0.15	0.42
Cross Direction	1.01	0.44

It is seen that the contraction from 50 per cent to 15 per cent relative humidity is practically the same for both the machine and cross directions, while the two changes are radically different when the humidity is raised from 50 per cent to 95 per cent; in fact, the cross direction changes in dimensions are six to seven times as much as the machine direction.

Dimensional change measurements were also made on samples taken at various places across the paper machine web. Total changes in cross grain dimensions for a humidity change of 95 per cent to 15 per cent are greater on the edges of the sheet than the center. These data emphasize the importance of knowing the origin of a sample in relation to the paper machine web when comparisons are to be made.

Ten samples of 20 lb. folio sheets were subjected to the following test: first, one set of samples were run through the normal 50 per cent-95 per cent-15 per cent relative humidity cycle, then a second set of samples were tested when the cycle was reversed; i.e., 50 per cent-15 per cent-95 per cent. Results indicate the importance

FASTER PRODUCTION... LOWER COSTS...

with this Thrifty new machine

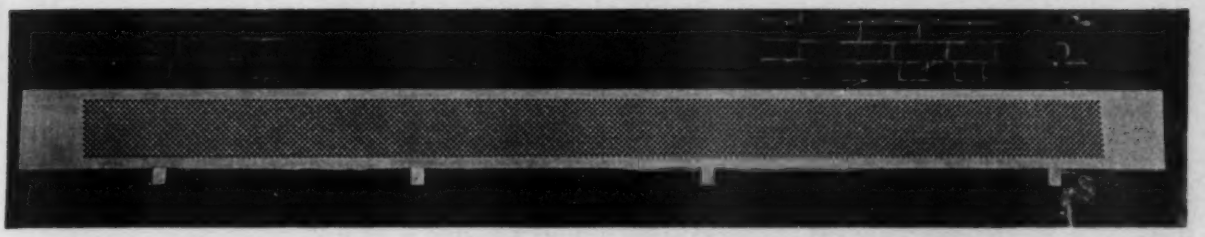
Moves More Tons Per Day . . . At Less Cost Per Ton

It's here! A new *low priced* Towmotor lift truck —the LT-40—engineered especially for faster, easier handling of *1000* to *3000 lb. loads.* Speedy, rugged, yet light in weight, this mighty little LT-40 picks up, hauls and stacks bales, boxes, rolls, or flat sheets for *less than half of a hand trucker's wages.* Travels faster, lifts faster than any machine in its class. Towmotor Co., 1271 East 152nd Street, Cleveland, Ohio.

GET THIS BOOK
Tells how to speed production and cut costs with Towmotor *Job-Fitted Lift Trucks*—up to 5-ton capacity.

"Man! What Comfort —And Lots Safer, Too!"
Better vision, less tiring, greater safety—thanks to Towmotor's seated center control and roomy, upholstered driver's seat.

Let TOWMOTOR (CLEVELAND) take the load off your hands



NO RE-SURFACING...

IN 12 MONTHS...

This Monel suction box cover, made by William A. Hardy & Sons Co., Fitchburg, Mass., is one of several in a Massachusetts mill. Used on both "wet" and "dry" boxes carrying 4 to 6 inches of vacuum, they operate on 112" and 76" fourdriniers producing fine writing papers.

Covers formerly employed used to be resurfaced about every *13 weeks*. The Monel covers still have a glass-smooth surface and are free of grooves after *a year* of continuous service. And most important, the wire does not freeze to the Monel covers on the "dry" boxes, a difficulty experienced with the old covers.

IN 24 MONTHS...

One of two board machines at a Mississippi mill with Monel suction box covers ¼ inch thick with ⅜ inch diameter openings. Regarding them the mill states:

> *"...The Monel suction box covers which were furnished us in 1937 have operated to date (May 1939) without the necessity of resurfacing."*

This 24 months service compares with but 4 months service between resurfacing obtained from covers which Monel replaced.

The experience of these two mills is so outstanding that it warrants your immediate attention and inquiry. It is realized that every fourdrinier has its own idiosyncracies, therefore your fourdrinier may or may not provide conditions permitting duplication of the results obtained at these mills. Write us about your service conditions and we will be glad to give you our best recommendation. Please address:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street **New York, N. Y.**

MONEL

"Monel" is a registered trade-mark of The International Nickel Company, Inc., which is applied to a nickel alloy containing approximately two-thirds nickel and one-third copper.

GASKET
New GASKET
Handbook and Catalog
64 fact-packed pages of advanced engineering data . . . complete size and price information . . . many new and improved products . . . profusely illustrated . . . concisely written . . . to offer time-saving reference.
Your copy sent on request.
GOETZE GASKET & PACKING CO., Inc.
46 Allen Avenue, New Brunswick, N. J.
Branch Offices in Principal Cities
"America's Oldest and Largest Industrial Gasket Manufacturer"

Exact Alum control makes better paper

Duriron Dissolving Jet

And *exact* control is easy to get . . . by using *dissolved* alum.

Then an excess isn't used, to make the paper brittle. Nor too little, that causes poor sizing.

The Duriron Dissolved Alum System gives the Superintendent exact control of strength and amount . . . not only makes better paper, but saves money on alum purchases.

All parts of the System are free from any corrosion by alum.

●

Let us tell you more about it. Write today.

The DURIRON COMPANY, Inc.
General Offices and Plant: DAYTON, OHIO
Branch Offices and Sales Representation in Principal Cities

of following the same humidity cycle in order to obtain comparative results.

As another experiment, ten samples were cut in the cross machine direction and subjected to the normal cycle of 50 per cent-95 per cent-15 per cent relative humidity, and measurements taken as usual; then, the samples were allowed to come to equilibrium at 50 per cent relative humidity and the whole cycle repeated. These data point out that the second cycle has the same total dimensional change as the first cycle, within experimental error. These results agree with those of Seborg [*Ind. Eng. Chem.* 29:169-72 (1937)], who found that even after seven consecutive cycles a hysteresis loop persists and that the values are practically the same.

Because of the fact that the measurement of dimensional changes with the use of humidified air is at best quite time-consuming, the immersion method was developed and used because such tests are easily and quickly executed, and it was hoped that the two methods might correlate to some extent. The two methods, however, do not correlate well. The immersion method gives values greater than those of the humidified air method—explained by the fact that the added factor of swelling has been introduced. The immersion method values closely approximate the shrinkage encountered in drying the sheet on the paper machine. Apparently, then, to obtain a true picture of the dimensional changes to be encountered in papers due to varying humidity, the humidified air method must be used; on the other hand, the immersion method can probably be of value as a test for papers where the use requirements necessitates an actual wetting of the sheet, such as photography, intaglio engraving, and other special types of printing.

Methods and Instruments Used in Controlling the Color of Beater Furnishes

R. N. GRIESHEIMER, Physicist
Mead Corporation

Any method of beater room color control, visual or instrumental, that does not consider the effect of important machine variables on color cannot assure a color match for the finished sheet. Certain dyes are quite sensitive to *p*H or to-wire freeness, for example, and in closed white water systems there is always the problem of build-up of dye concentrations and fines. Alum (to reduce *p*H) is often added to the tray water, and it is not uncommon for the dye man to add some shading dyes at the machine chest providing the agitation is good there. Because of these and other factors it is very often if not always essential to make corrections in beater dying on the basis of either a visual or instrumental examination of the sheet over the dry end.

Instrumental methods of beater room color control may be considered in two classes. First there are the empirical methods, the success of which lie in the ability of a technical man to associate various dyestuffs with the shapes of their spectrophotometric curves, and displacements of these curves with changes in dye concentrations. Secondly, there are the methods of absolute calculation that involve the calculation of certain optical constants of the raw materials and finished sheet from either the Kubelka and Munk theory or the theory of Trichromatic Coefficients. Considered only as absolute methods of calculation, these two theories are of great academic interest, but have as yet not met with widespread use in the industry.

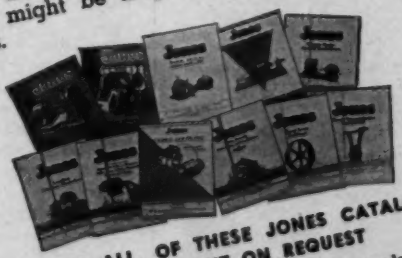
At present, empirical methods of instrumental beater room color control are the most promising from the practical point of view. Two such methods will be discussed to illustrate the possibilities of the empirical approach, but it should be remembered that both of these are subject to modifications and revisions;—the specific color problems with which a particular mill is faced will in the end determine the method that will work most efficiently for that mill.

The most common empirical method (the Munising method) is simply the adjustment of beater dying as indicated by a spectrophotometric examination of (a) a handsheet made from the dyed beater furnish, and (b) periodic machine samples that are taken at short intervals at the start-up, and less frequently as the run continues. When starting a new order a sample of colored stock is taken from the beater before it is dropped, made into a small handsheet, and checked for color on the spectrophotometer. This provides an opportunity for adjustment, if necessary, before the stock is sent to the machine chest. As soon as the stock gets to the dry end of the paper machine a beater engineer gets a sample and checks it on the spectrophotometer against the standard reflectances set up for the order. (Usually four wave lengths are

In the Paper Industry—
JONES DRIVES

YOU will find Jones Speed Reducers and transmission products on important drives in paper mills in every section of the country. For nearly a half century the Jones organization has been working with the manufacturers of paper making machinery and with engineers in the paper industry, on a wide variety of drive problems.

As a result of these years of experience, the Jones organization has collected a vast amount of technical data relating to drives in the paper industry. This information is available either in the form of catalogs or in our files. You are cordially invited to make use of any of this material, or our services, in any way you feel might be helpful in solving your drive problems.



ANY, OR ALL, OF THESE JONES CATALOGS WILL BE SENT ON REQUEST

No. 70—Jones Herringbone Speed Reducers
No. 71—Jones Cut and Molded Tooth Gears
No. 75—Jones Worm Helical Speed Reducers
No. 55—Jones Spur Gear Speed Reducer Units
No. 68—Jones Worm Gear Speed Reducers
No. 60—Jones Lemley Friction Clutches
No. 58B and 76—Jones V-Belt Sheaves
No. 78—Jones Flexible Couplings
No. 56—Jones Roller Bearing Pillow Blocks
No. 69—Jones Cast Iron Pulleys
No. 61—Jones Power Transmission Equipment

W. A. JONES FOUNDRY & MACHINE CO.
4439 Roosevelt Road, Chicago, Ill.

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS • PULLEYS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

Jones herringbone speed reducer on a straw washer in a paper mill.

Wet end of sectional paper mill driven through a Jones herringbone speed reducer.

Vertical agitator in paper mill driven through a Jones herringbone speed reducer.

Group of agitator drives in a paper mill driven by Jones herringbone speed reducers.

Jones worm-helical speed reducer on a pulp tank drive.

Paper mill agitator driven with a Jones worm-helical speed reducer.

adequate for this work, data often being taken at 458, 480, 556, and 660 millimicrons). If necessary, "doctoring" begins, and spectrophotometric checks follow until the standard is matched within the established tolerance limits. In due time the beater room engineer amasses the experience necessary to adjust his dye formula so as to "pull the reflectances at the four wave lengths into line." He learns, for example, about how much an extra ounce of blue or red dye affects each of the four reflectances, and uses this information in adjusting his dye formula.

Another empirical, instrumental means of beater room color control is the so-called "card index" system, or planned method for the equilibrium of the run. It differs from the above method in that it tends to shift some of the responsibility for color matching from the beater room dye man to the technically trained man,—a desirable shift in cases where the dye man, although perhaps quite experienced in visual color matching, does not have the technical training necessary to undertake an analysis of spectrophotometric data. The card index system is based on the assumption that all of the important variables affecting the color of the final sheet of paper may be separately considered in the laboratory, and after a large amount of laboratory handsheet dying and calculation based on either the Kubelka and Munk theory or the theory of trichromatic coefficients, compensations in dye formulas can be offered to take care of any reasonable variation in any one of the factors. Finally the dye formula is successively corrected for variations in each of the individual factors. After the system is set up the dye man looks to the cards for the dye formula he should use in matching a given color. He has a minimum of data to take and calculation to make, most of the work having already been done in setting up the index file.

Whereas the first method discussed demands that the dye man form his own conclusions, having taken the necessary spectrophotmetric data, the card index system figuratively takes his data and then tells him the dye formula to use. In the end the system does not add a technical man to the mill payroll, but merely demands a year or two of his time, as a development man, for setting up the program. This being the case the card index system should be especially attractive to the larger corporations that own several mills, all of which have the same or similar color problems; once the system is put into operation at one mill and proved there, it can be transferred bodily to any other mill with little additional expenditure. After the index file has been completed there is little or no need for an expensive spectrophotometer to keep it going; simple auxiliary apparatus will then suffice for most color matching problems.

One of the most important considerations in beater room color control concerns the reduction of start-up losses due to off-color. Depending on the capacity of the white water system and the machine speed, the color of the sheet gradually deepens while the concentrations of dye and fines are being built up to normal. If the time required to reach equilibrium conditions is appreciable, it is necessary to dye the first beater or two heavy, and occasionally add dye at the machine chest. Also the *p*H of the fresh water in the tray must be adjusted, either by addition of alum directly to the tray water or by lowering the *p*H of the beater stock to a point where, when it meets the fresh water of the white water system, it will rise to the desired operating range. Every dye man in every mill using closed white water systems must appreciate these facts.

Start-up losses are especially important in short runs where they represent an appreciable percentage of the total tonnage. Consequently it seems essential to reserve one card in the card index file for start-up adjustments. Such a card would specify the low *p*H for the first beater or two, it having been previously determined what this *p*H must be so that, when the stock meets the high *p*H of the fresh water, a satisfactory *p*H will result. Further, the same card would specify the percent increase in the various dyes, for the first, second, and possibly third beaters, necessary to give the correct color while the white water dye and fine concentrations are building up to normal. In those cases where running changes are made from one color to another, still another card would specify the dye to be added to the tray water to kill an undesirable yellow, for example, from the previous color.

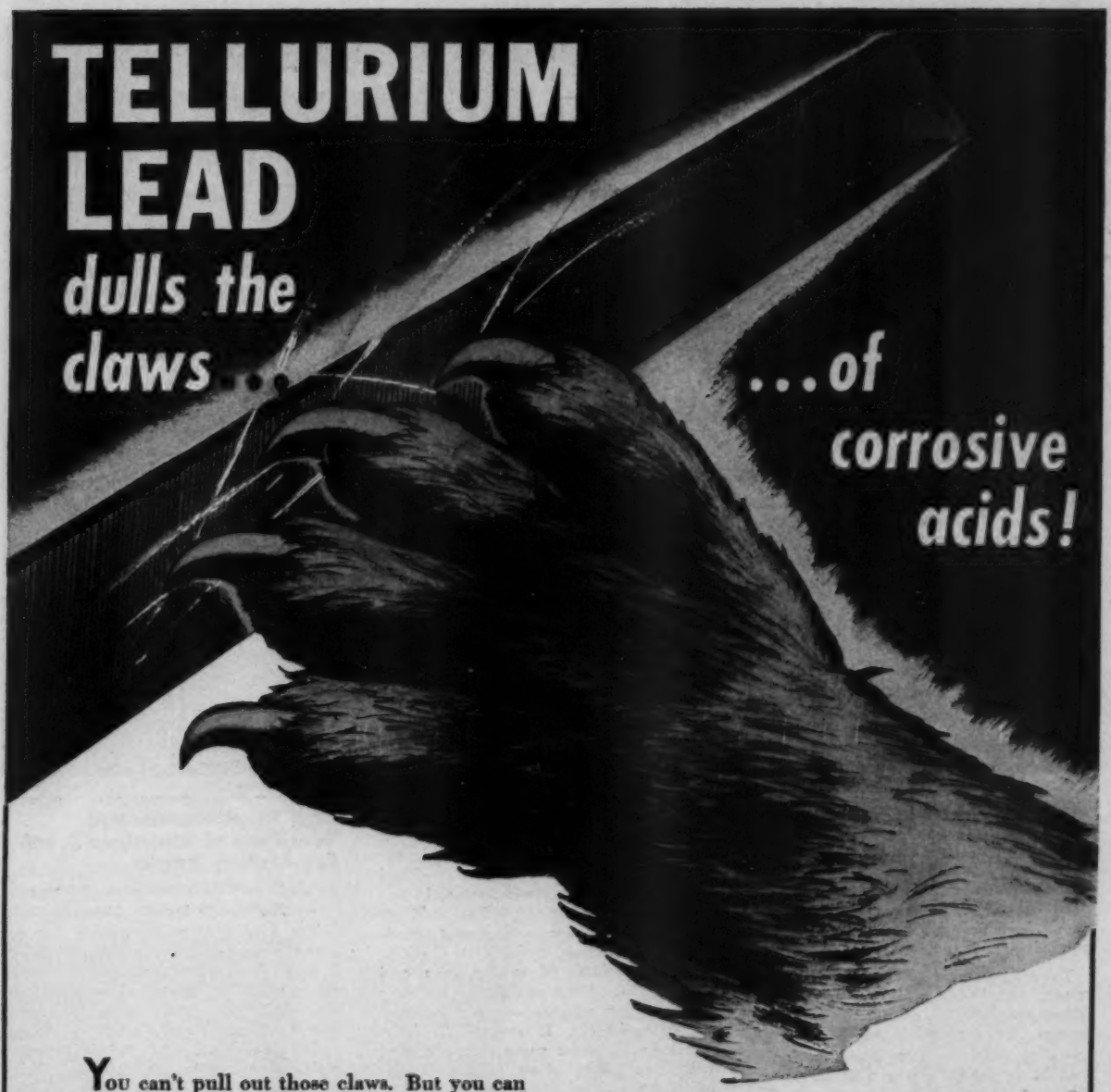
By this time the reader may have the impression that so many cards are neces-

INDUSTRY
Looks to Toledo
● This is a percentage scale, Toledo-developed to solve a specific problem in curing hams.
You don't cure hams? No—but you probably use percentages in your own production. If so, the *basic principle* of this ham scale may help solve some of your problems, too.
Industry looks to Toledo for the solution of its tough weighing problems. And for greater accuracy and speed in its regular industrial weighing. This percentage scale is a symbol of Toledo's superior engineering knowledge and versatility. It's one of "45,000 Ways to Weigh"—and that's the title of a new illustrated brochure that you will find interesting and helpful. Send for it.
Toledo Scale Company, Industrial Scale Division, Toledo, Ohio.
TOLEDO SCALES

TELLURIUM LEAD

dulls the claws...

...of corrosive acids!



You can't pull out those claws. But you can blunt them—by turning over your acid-handling jobs to Tellurium Lead.

A lead with an enviable success story. In our files are user reports from many different industries. Telling how Tellurium Lead has prolonged the life of equipment. Telling how it has reduced shut-downs for repairs. Telling of longer service even when the sulfuric acid was heated to a temperature very close to the melting point of the metal.

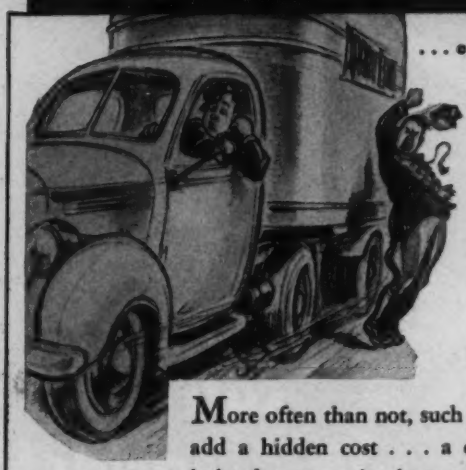
Another highly important property of Tellurium Lead is this: *It toughens under stress.* When rolled, stretched or hammered, it actually becomes stronger. As a result, turnover points and joints are less subject to cracking. Furthermore, where vibration occurs, this capacity to develop latent strength minimizes buckling and creeping. It also gives Tellurium Lead improved resistance to fracture due to repeated heat changes.

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantages of this well-known chemical lead plus important new ones. Yet now it costs only a fraction of a cent more per pound than chemical lead. Available in sheets, pipe and coils. For further facts, write our nearest branch.

NATIONAL LEAD COMPANY

New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National-Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co., Pittsburgh; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis; Master Metals, Inc., Cleveland; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.

HIT OR MISS METHODS



. . . of ordering your alkalies do not result in savings

More often than not, such methods add a hidden cost . . . a cost that is hard to trace in the manufacture of your paper. Write for the Solvay Products Book today for information on *ALL* Solvay Alkalies!

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK, N. Y.

BRANCH SALES OFFICES:

Boston Charlotte Chicago Cincinnati Cleveland Detroit New Orleans New York Philadelphia Pittsburgh St. Louis Syracuse

SOLVAY ALKALIES

MICRO GROUND

Laboratory controlled selection of steel, scientific heat treating and correct design for your work.

LORING COES COMPANY

ESTABLISHED 1830

Worcester • Massachusetts

sary in the card index system that it has become hopelessly complicated. Such is not necessarily the case. Usually the problem is hardest to handle on Monday morning start-ups, but once a long run of a given color has been gotten under way, checks on the variables and corrections for them proceed quite smoothly.

Tolerances are of prime importance, of course, and in operation the card index system considers the relation between tolerances and the corresponding range of operating variables. Thus it may be shown that the to-wire freeness on a run of salmon can vary any place between 100-120 cc. Green, with the subsequent variation in color being within the accepted tolerance limits. Freeness corrections will not be attempted on this color until the freeness departs from these limits. Tolerances may change from time to time, of course, being small in bad times when competition is keen and large in boom periods when almost any kind of paper is acceptable on the market.

In conclusion, a few comments will be made concerning the selection of the method and instruments to fit a particular mill's requirements. First of all, a survey of the annual loss due to off-color and color variations and an estimated savings over a ten-year period will suggest the amount of money that can be safely invested in beater room color control. If this amount is small, the simplest of abridged spectrophotometers will probably represent the best investment. Such an instrument should be adequate for putting into practice the first empirical, instrumental method discussed herein; i.e., adequate, but of course not as convenient as a recording spectrophotometer. If the problem is considerably more involved and larger sums of money may be saved, then it would be desirable to purchase a recording spectrophotometer and present a capable technical man, probably a physicist, with the problem of setting up a card index system of one sort or another, later building or purchasing necessary auxiliary control equipment. If most of the mill's production is white paper more attention will have to be given pulp and filler brightness and color than if deeply dyed colors were the majority. Regardless of the instruments available and method chosen, that method will have to be adapted to the individual problem of the individual mill. Even should the card index system be chosen, the variables that may be of prime importance in one mill may be secondary in another, and the method should be tailor-made to best serve its function.

ACKNOWLEDGMENTS—The author wishes to acknowledge the efforts of Dr. L. C. Lewis, Dr. R. E. Stevens, and Mr. Kenneth Langley in furthering the development of the card index system, the system herein described being original with Dr. Lewis. He is especially indebted to Dr. Lewis for suggestions and criticisms helpful in the composition of this paper and to F. E. Greenwood of the Munising Paper Company for his description of the method of beater room color control used in the Munising mill.

The Application and Welding of Stainless Steel for Lining Tanks

E. W. P. SMITH, Consulting Engineer
The Lincoln Electric Company

The welding of stainless steels does not present any very difficult problems, much of it being done in the same manner as with the usual structural steels. Proper and adequate equipment, and personnel are necessary if satisfactory results are to be obtained.

For use on the 18-8, 18-8 SMo, and other stainless steels on the market today, suitable electrodes of the same analysis or richer are used, providing weld metal of proper physical and chemical properties for welding these steels. A coating is provided on the electrode, which prevents oxidation of the weld metal and aids welding and keeps the analysis of the deposited metal virtually the same as the parent metal.

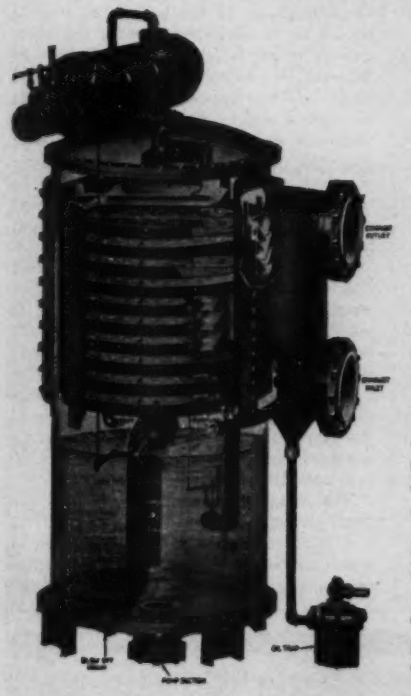
The work should be prepared as for ordinary metallic electrode welding of mild steel, except the electrode should be positive and the work negative.

For severe conditions there is a modification of the well known 18-8-S stainless steel analysis, commonly known as 18-8 SMo with approximately 3½ per cent of molybdenum added to 18-8-S. It is suitable for welding stainless steels of types 316-317. 18-8 SMo is 18-8S with the addition of molybdenum.

The fabrication of new equipment is a relatively simple problem compared to repairs or changes to existing equipment. One of these changes is lining vessels, either new or old.

STICKLE FEED WATER HEATERS*

Afford Higher Efficiency and Greater Economy



1. For Heating Boiler Feed Water
2. For Heating Water for Beaters and Other Processing Services

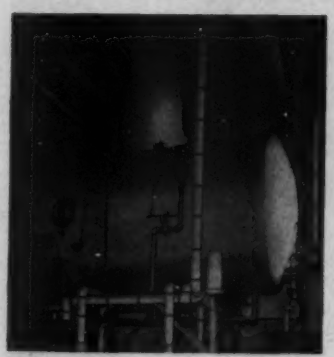
For greater economy of fuel—for reducing the cost of steam—for hot water at low cost wherever it is required—Stickle Feed Water Heaters fully meet all requirements. Their performance pleases from the standpoint of greater operating efficiency as well as greater operating economy.

Stickle Open Coil Feed Water Heaters have great tray surface. Feed water is brought into direct contact with steam, permitting instantaneous transmission of heat from steam to water. Steam condensed in heating make-up water becomes a part of the supply for feeding boiler, conserving a tremendous quantity of pure, distilled water, free from scale-forming substances, for boiler use. Expensive repairs and operating difficulties of other types obviated.

All internal parts removable through door. Three piece fitted trays quickly removed, cleaned and replaced. Liberated lime and magnesia remains in trays —water does not overflow sides of trays and scale-forming substance does not accumulate on side walls of heater.

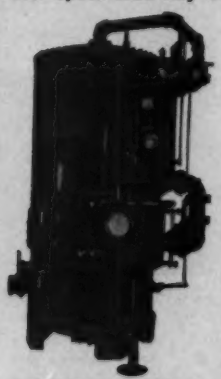
High efficiency with Stickle Open Coil Construction (see sectional illustration) is incorporated in all the different types of Stickle Heaters. It is the result of 35 years experience in designing and building feed water heaters of both deaerating and non-deaerating types, adaptable to the requirements of varying plant conditions. Maximum efficiency in Stickle Heaters is obtained with few operating interruptions and with extremely low upkeep.

***Open Coil Construction . . . Any Desired Capacity . . . Deaerating and Non-Deaerating Types . . . Built-in Metering Equipment when desired . . . Cast Iron or Steel Shells . . . Adaptable to Individual Feed Water Heating Requirements . . . Guaranteed to Heat Water to Higher Temperature in Less Space than Any Other Heater.**



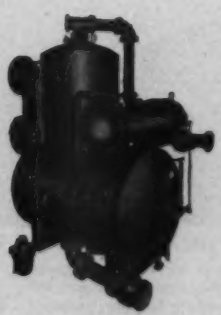
PREVENTS WASTE

The Stickle Heater built with extra large storage and heating capacity prevents loss due to overflow caused by intermittent condensate returns.



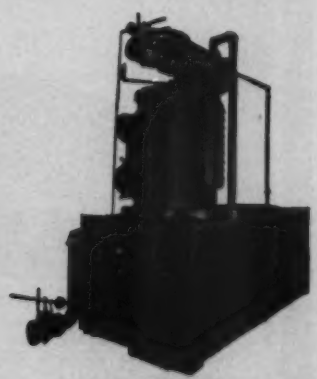
PERMANENT RECORDS

Stickle Metering and Recording Heaters furnish permanent records for future data in checking steam consumption and boiler efficiency, allowing close daily check on operation.



HIGH OPERATING PRESSURES

Stickle Heaters of All-Steel Construction for both heating and storage sections are built to afford safe operation at high back pressure. Result: Maximum feed water temperature and high overall boiler efficiency.



CAST IRON STORAGE TYPE

This type of Stickle Heater supplies permanent installation, insures low maintenance and high heating efficiency. Extra storage prevents heat losses, conserves water and eliminates excess water treatment.

Write for Bulletin 100-IW

STICKLE STEAM SPECIALTIES CO.

2233 VALLEY AVENUE, INDIANAPOLIS, INDIANA

Manufacturers of the Stickle Line of Dependable Steam Specialties, including Steam Traps, Regulating Valves, Automatic Vacuum Valves, Vacuum Heating Systems, Differential Drainage and Boiler Return Systems, Oil and Steam Separators, etc.

Stainless clad sheet linings are applicable to new and old vessels for the prevention of corrosion or rusting and to eliminate contamination of liquid or dry products in processing or storage.

It is difficult to predict exact costs for tank lining applications unless the design, size and quantity are known. In most cases, the cost for the sheets required ranges between 50 and 65 cents per sq. ft. of area. This price is based on the use of U.S.S. 16 gage stainless, having a 20 per cent layer of 18-8 stainless steel, annealed and white pickled finish.

It has been found that direct labor costs will range between 12 and 20 cents per sq. ft. Stainless steel welding rod costs in the neighborhood of 5 to 7 cents per sq. ft. of lining. Labor costs are dependent upon the design of the vessel to be lined and existing labor conditions.

When stainless clad sheets are applied to riveted tanks, it is advisable to figure the lining sheet sizes so that they will cover each individual plate of the tank, to a point within ¾ in. of the rivet heads. These sheets are welded to the tank plates. Later, formed cover-up strips are placed over the rivet heads and welded to the adjacent lining sheets.

This procedure allows the stainless sheets to stay in close contact with the tank plates. When the individual tank plates are large, and it is impossible to obtain sheets of the same size, a greater number of sheets are used to cover each individual plate. Sometimes there are as many as 4 to 6 sheets used to cover 1 large plate. Welding is done by the lap method.

When welding stainless clad linings to tanks of butt welded design, it is generally not necessary to use formed strips to bridge the welded joints of the tank. All sheets can be applied by the lap method.

To line the inside of an existing concrete silo, vat or storage bin, it is possible to apply stainless clad sheets by welding, provided steel bars are attached to the concrete walls with foundation bolts. (Machine screw-type lead anchors, are recommended for this purpose.)

On new concrete structures, it is advisable to cast steel angles or tees into the concrete and weld the sheets to them.

Stainless clad lining sheets may be attached with the long dimension either vertical or horizontal. However, it is preferable to have the long weld seams vertical when the design permits. Sheets should be attached around the top of the tank first, then each succeeding course below applied, working downward. This procedure favors the welding of the horizontal seams.

Tank linings should be laid out in such a way that sheets in standard sizes can be used. Standard sizes are 24 to 36 in. wide, and 60 to 120 in. long. Greater widths can be used if desired, but a width-extra is charged.

It is generally not necessary to preform the sheets, as they can be pushed into position manually. Occasionally, however, it is advantageous to preform the sheets to a somewhat smaller radius than that of a cylindrical tank in order to facilitate applying the sheets.

It is not necessary to preform the sheets to a radius in the shop, as it is possible to make a forming rigging from timbers in the field.

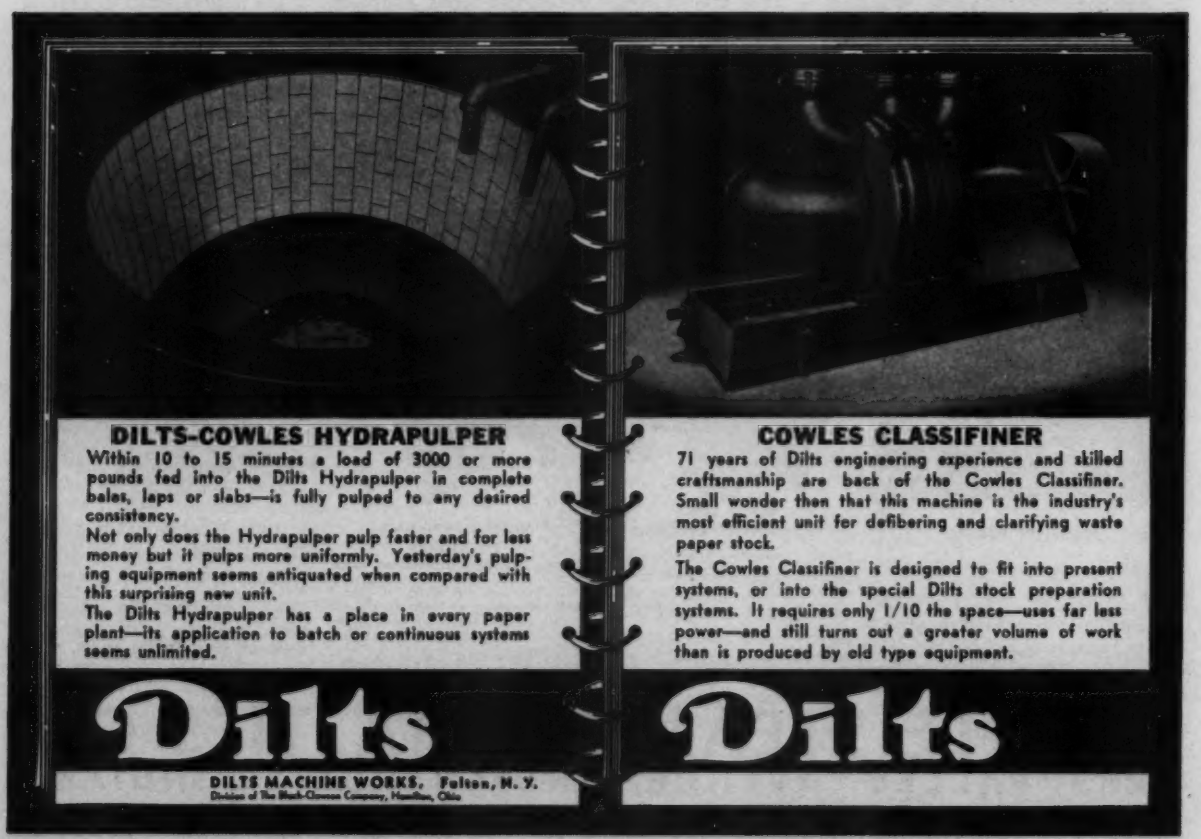
When lining a rectangular vessel, it is advisable to bend the edges of the sheets at the corners to eliminate fillet welding. Also, it is advisable to preform the sheet edges where the lining sheets must lap over a reinforcing angle at the top of an open tank.

When sheets are placed in position, they are spot welded to the tank wall to hold them in place. If the tank is to contain liquids, it is advisable to weld the sheet entirely around which isolates each sheet. In this case, if a leak should develop, it would affect only one individual sheet. A tell-tale hole can be drilled through the plate immediately in back of each lining sheet; then when the vessel is filled for testing, if there is a leak, it will be noticeable and can be traced to the individual sheet, located and repaired. After test, the tell-tale hole can be welded.

The underneath, or nonexposed welds may be made with mild steel shielded-arc welding electrodes. A diameter ⅛ in. is satisfactory for most applications. An all-purpose, all position, shielded-arc electrode should be used for this purpose.

The exposed welds that must resist corrosion should be made with an electrode of the proper analysis, $\frac{3}{32}$ in. diameter. Vertical welds are made in downhill direction. It is not advisable to weld upward.

The welding operator should hold his electrode or welding rod about 30 to 45 deg. from perpendicular in the direction to which the weld is progressing. This tends to keep the slag from running ahead of the


DILTS-COWLES HYDRAPULPER
Within 10 to 15 minutes a load of 3000 or more pounds fed into the Dilts Hydrapulper in complete bales, laps or slabs—is fully pulped to any desired consistency.
Not only does the Hydrapulper pulp faster and for less money but it pulps more uniformly. Yesterday's pulping equipment seems antiquated when compared with this surprising new unit.
The Dilts Hydrapulper has a place in every paper plant—its application to batch or continuous systems seems unlimited.
COWLES CLASSIFINER
71 years of Dilts engineering experience and skilled craftsmanship are back of the Cowles Classifiner. Small wonder then that this machine is the industry's most efficient unit for defibering and clarifying waste paper stock.
The Cowles Classifiner is designed to fit into present systems, or into the special Dilts stock preparation systems. It requires only 1/10 the space—uses far less power—and still turns out a greater volume of work than is produced by old type equipment.
Dilts
Dilts
DILTS MACHINE WORKS, Fulton, N. Y.
Division of The Black-Clawson Company, Hamilton, Ohio

WHY P.M.C. PREPARED ROSIN SIZE IS THE PREFERRED SIZE OF THE INDUSTRY

1. Since 1900, paper makers have used PMC Prepared Rosin Size.

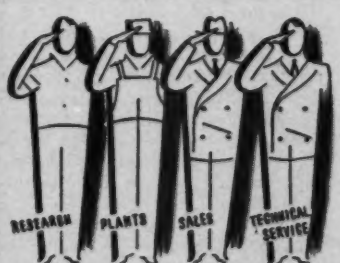
2. Users of PMC Prepared Rosin Size save time, trouble, expense.

3. Through its 40 years of manufacturing paper makers chemicals, PMC has built a background of technical service unequalled in the industry.

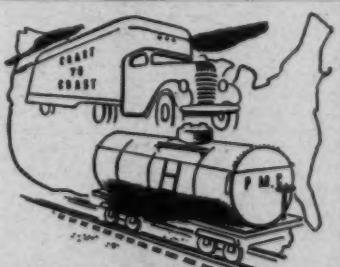
4. Large-quantity consumption permit, accurate grading and blending of the rosin used in PMC Prepared Rosin Size.

5. The manufacture of PMC Prepared Rosin Size is technically controlled.

6. Large-scale production of PMC Prepared Rosin Size makes its quality unvarying and its supply dependable.



7. PMC's main business is prepared rosin size. All branches of our business are at your service in sizing problems.



8. PMC distribution facilities give paper makers prompt service from coast to coast and border to border.

9. Wire, write, or telephone the nearest PMC office to get PMC Prepared Rosin Size and PMC technical service—best in the industry.

SUPERIOR PMC CHEMICALS

REG. U. S. PAT. OFF.

PAPER MAKERS CHEMICAL DEPARTMENT

HERCULES POWDER COMPANY
Incorporated
KALAMAZOO, MICHIGAN

Stoneham, Mass.
Holyoke, Mass.
Albany, N. Y.
New York, N. Y.
Wilmington, Del.

Atlanta, Ga.
Savannah, Ga.
Jacksonville, Fla.
Pensacola, Fla.

Marrero, La.
Milwaukee, Wis.
Chicago, Ill.
Portland, Ore.

San Francisco, Calif.
Freeman, Ont.
Erith, England
The Hague, Holland

PM-73

weld puddle. Set the welding generator to the most desirable amperage. If the amperage is too low, it is difficult to maintain an arc. If the amperage is too high, the welding rod will overheat.

About 300 in. of stainless lap weld can be obtained with each lb. of $\frac{1}{8}$ in. diameter welding rod. Ordinarily, these rods are furnished in 9 in. lengths, and there are 44 to 45 rods per lb. Each welding rod will make 8 to 9 in. of weld bead if properly used.

The ease of application and welding of stainless is resulting in application to such items as valves, fittings, cover liners, strainers, pipe or tubing, circulating pump for circulating systems in relief systems of sulphite digesters where hot saturated sulphur dioxide gas containing organic matter must be handled. These alloys have made possible the indirect cooking method.

Of course, much is to be done along lines of further application and study. And the co-operative action of the steel man, welding man and paper man will result in low cost efficient performance of equipment.

Abridgments of some of the papers presented at the annual meeting of the Superintendents Association held in Cincinnati, Ohio, June 18, 19 and 20, 1940, appeared in the July and August issues. Another installment of these abridgments is published this month.

Regulation for Boilers and Paper Machines

A. C. WENZEL, Chief Contract Engineer Republic Flow Meters Company

In general there are two types of regulators; namely, the type "A," or positioning regulator, and the type "B," or measuring regulator. All regulators or machine controllers come under either one of these two classifications. There are many so-called regulators on the market which are not truly regulators. These may be automatic switches for starting or stopping certain equipment when certain pressures are reached, or certain flows are reached, but these devices in the true sense of the word are not regulators and therefore will not be covered in this discussion. The discussion will be limited entirely to the two fundamental types of true regulators.

A. *Positioning Regulators.*

This classification covers any regulator, or damper, or valve actuating device, in which the damper, or valve, or other controlled equipment takes a definite position when a certain predetermined pressure is applied to the receiving or pressure sensitive diaphragm. Thus, for every received pressure, the regulator moves the damper, or valve, to a certain definite position. This position may be determined by means of a spring which is opposed by the measuring diaphragm, or by a cam which may be cut in some predetermined shape to locate the damper or valve in the desired position for a given received pressure, or by a combination of diaphragm, spring and cam to obtain the desired resultant position with the application of a definite predetermined pressure.

B. *Measuring Regulators.*

In general there are three types of measuring regulators. These may be classified as: (1) Characteristic or droop type; (2) Reset type; and (3) Isochronous type, meaning a regulator without characteristics.

(1) *Characteristic or Droop Type Regulators.*

Common examples of regulators of this type are the common spring-loaded pressure relief valve, and the diaphragm-operated valve which may be used for regulating upstream or downstream steam pressure directly to the diaphragm of the valve where it is opposed by a compression spring. In this type of regulator, an increase in downstream pressure—for instance, in the case where the valve is used as a pressure reducing valve—will cause a closing of the valve, while a drop in downstream steam pressure will cause an opening of the valve.

(2) *Reset Type of Regulator.*

Practically all of the instrument type of controllers which are equipped with compensating devices provided to cancel the characteristic come under this classification. This is true of the various temperature controllers, as well as instrument type of flow and pressure controllers. In these various instruments, which are usually air-operated, the reset device may be a combination of small bellows, or hydrons, which operate shifting linkages and create balancing forces for obtaining constant pressure, flow, or temperature control at all rates of operation.

(3) *Isochronous Regulator, or Regulator without Characteristic.*

This type of regulator is one in which there is always a true balance between the master loading pressure, or force, and the controlled pressure, or force. This regulator does not depend on characteristic of any type to make it stable, nor does its operation result in any droop or characteristic. It is a true measuring regulator and must consist of three elements.

The three elements which are the essentials of a good isochronous measuring regulator are:

A. Measuring Element
B. Power Element
C. Stabilizing Element

In connection with this discussion of regulating equipment, it might be well to outline a few of the definitions and terms which are frequently used, and often misused, in discussions of regulators.

Five terms commonly used in connection with regulators will be defined:

A. Sensitivity
B. Speed
C. Stability
D. Power
E. Characteristic or Droop (throttling range)

All the beaters in the paper industry have been doing their job for years and years—but always needing help. Effective deflbreing and dispersion can be obtained more quickly and on a far more dependable basis by using one of the tried and tested wetting and dispersion agents.

GET YOUR COPY

This collection of performance reports on Magnus Beatex, Hydrex and other Magnus materials for the paper mill is well worth studying. Users' reports tell the results they are now getting compared with formerly used materials and methods.

MAGNUS BEATEX AND HYDREX

which give your beater the help it needs. They save beater time and Jordan power. They greatly improve deflbreing and insure thorough dispersion of the hard sulphate stocks. Formation is better and desirable qualities in finished stock are usually improved once experiment with these agents determines the amounts and types required. We want to cooperate with you in helping your beater do a better job. Let the Magnus man in your neighborhood work with you to select the Magnus Wetting and Dispersing Agent best suited to your papers.

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants.

192 South Avenue Garwood, N. J.

MAGNUS CLEANERS

Sensitivity is the amount of change in the controlled quantity required to affect the regulator. Obviously, a regulator with a maximum sensitivity of 1 lb. per sq. in. will not respond as quickly as a regulator sensitive to changes of 0.1 of 1 lb. per sq. in. Therefore, the more sensitive the regulator, the shorter will be the interval between the time the pressure begins to change and the time the regulator responds to this change. The response of a highly sensitive regulator will be practically instantaneous.

Sensitivity, therefore, is a function of the starting friction; namely, the force which must be overcome to set the regulator in motion. This term of sensitivity is often confused with characteristic or throttling range, and some of the control manufacturers producing instrument types of controllers of the characteristic type, often refer to the droop or throttling range as the sensitivity of the unit. This is entirely incorrect, since sensitivity and characteristic or droop are not related in any way.

Speed refers to the rapidity with which the regulator operates the controlled device. Any time required to adjust the controlled device, after the measuring element detects the variation in the controlled quantity, will permit the controlled quantity to deviate still further from normal. Therefore, in order to reduce the time leg of the system to a minimum, a regulator must be fast enough to follow the fastest load fluctuation. Speed is usually defined as the time required for the regulator to make a full stroke from the closed to the open position, or vice versa, with a given deviation or deflection of the measuring element.

Stability refers to the ability of a regulator to maintain the controlled quantity at a desired value without producing rhythmic or cyclic variations caused by the time lag in the controlled system, resulting from storage or inertia. Storage, or inertia, are usually fixed properties that cannot be eliminated from the system. Therefore, to nullify their effects and prevent the hunting rhythm from starting, the regulator must be equipped with some element that will provide the correcting factor. The entire system will then be stabilized by the stability of the regulator.

In many types of regulator on the market, this type of stabilizing element is not provided. Very often stability is maintained, or approached, by merely making the regulator move very slowly. This type of regulator is not truly stabilized, since conditions may occur in the load fluctuations which will cause it to hunt slowly and thus produce a rhythmic cycle.

Again, stability has often been confused with characteristic. A true stabilizing element does not have any permanent characteristic which it introduces into the operation of the cycle. A true stabilizing element introduces no permanent droop or characteristic and can be adjusted so that the regulator can move as fast as the cycle of control will permit.

A regulator must have sufficient power not only to operate the valve, damper, or other device it controls, but also to overcome any accidental friction, sticking, or abnuormal momentary pressures that may occur in any part of the system. Insufficient power will cause failure in operation. Excess power is a great advantage in a very

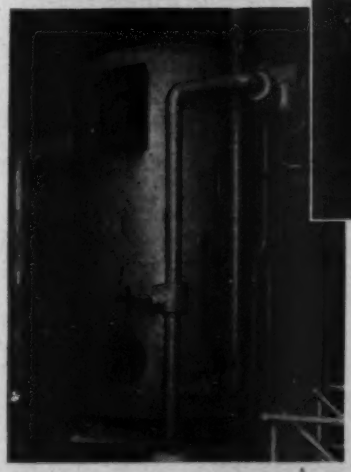
Steel Tanks and Platework for the PAPER INDUSTRY

RIGHT: Three welded steel salt cake storage bins of 833-tons capacity each, installed at the Brunswick Pulp & Paper Company mill, Brunswick, Ga.

LEFT: 10 ft. diam. by 32 ft. welded steel cyclone at the Container Corporation of America mill near Fernandina, Fla.

BELOW: U-Bar barking drum fabricated for Fibre Making Processes, Inc., installed at the Chesapeake-Camp Corp. mill, Franklin, Va.

LEFT, BELOW: 4 ft. diam. by 6 ft. welded steel condensate tank installed in the generator room at the Container Corporation mill near Fernandina, Fla.



WHENEVER you are contemplating the installation of storage tanks or steel plate work of any kind, write our nearest office for estimating figures. We will be glad to submit quotations, without obligation to you, on the most economical designs to meet your requirements.

CHICAGO BRIDGE & IRON COMPANY

Cleveland.....2367 Builders Exchange Bldg.
Birmingham.....1511 North Fiftieth Street
Tulsa.....1651 Hunt Bldg.
Houston.....918 Richmond Avenue
Detroit.....1566 Lafayette Bldg.
Philadelphia.....1653-1700 Walnut Street Bldg.
Boston.....1562 Consolidated Gas Bldg.
Los Angeles.....1459 Wm. Fox Bldg.
Chicago.....2445 McCormick Bldg.
New York.....3350-165 Broadway Bldg.
Dallas.....1446 Praetorian Bldg.
San Francisco.....1017 Rialto Bldg.

Plants at Birmingham, Chicago and Greenville, Pa.

NEW HOLLINGSWORTH & WHITNEY MILL

Semco lined pulp storage tanks 40' by 30' inside.

100% SEMCO LININGS

- √ Stock Storage Tanks
- √ High Density Bleachers
- √ Low Density Bleachers
- √ Chlorinators
- √ Acid Treatment Tank
- √ Bleacher Dump Chests
- √ Brown Stock Storage Tanks
- √ Tile Tanks and Washer Vats

Stebbins Engineering and Manufacturing Co.
Eastern Boulevard . Watertown, N. Y.

sensitive regulator, since it assures the proper operation of the controlled device in response to the slightest change that the regulator is designed to effect.

Characteristic or droop may well be defined as the change in controlled pressure, expressed in per cent, which will result from full closed to wide open position of the regulator. Relief valves, such as spring loaded safety valves, will have a rising characteristic, that is, they will begin to open at a low pressure and will be wide open at some higher pressure. Pressure reducing valves and regulators of that nature have a drooping characteristic, that is, they will control for high pressure near the closed position of the valve and for lower pressure at wide open position of the valve. Characteristic, or droop, are synonymous with throttling range. The expression "throttling range" is one which is used very frequently in conjunction with instrument type of controllers.

Since it is the purpose of this paper to present the application of the various types of regulators to a complete co-ordinated system of control, we have chosen the control of steam boilers to illustrate such a co-ordinated system. Therefore, it is appropriate at this time to outline some of the fundamental elements which must be controlled either by the operator by manual means or through a control system in order to maintain constant steam pressure and good combustion conditions at all plant loads.

In the control of a steam boiler of the usual type of design, five primary elements must all be co-ordinated in order to obtain the desired condition of constant steam pressure at all loads, as well as good combustion conditions and constant feed water conditions, regardless of the load demand on the unit. The five elements are as follows:

A. The steam header pressure must be maintained constant.
B. The rate of fuel feed must be controlled.
C. The supply of air for combustion must be controlled in proportion to the amount of fuel being fired.
D. The combustion chamber pressure must be controlled to prevent excess infiltration of air and also to prevent the flame from puffing out of the doors or inspection holes.
E. The feed water level must be controlled and maintained relatively constant, since the constant level will assure a rate of feed water flow to the boiler in proportion to the quantity of steam being produced.

The methods by which these five fundamental elements are controlled depend largely on the mechanical equipment provided for furnishing forced and induced draft and also on the type of fuel and the firing equipment provided.

There are three fundamental methods of burning fuel. These are as follows:

A. Fuel burned on a grate, such as an underfeed stoker, an overfeed stoker, or a chain grate stoker.
B. Fuels burned in suspension, such as oil, gas, or pulverized coal.
C. A combination of burning in suspension and burning on a grate, such as is provided by the spreader type of stoker.

In order to illustrate all types of regulators which were previously described; namely, the reset type, the positioning type, and the measuring type, we will take as an example a combustion control system for an underfeed stoker-fired water tube boiler, provided with constant speed motor driven forced draft fan and natural stack draft to carry away the waste gases.

The arrangement of this equipment is shown in simple line diagram of Figure 11.

In this figure you will note that the steam pressure element sends an air loading pressure to two mercury indicating gages, one of which is equipped with throttling orifice and bleed valve, and from these mercury indicating gage columns, air loading pressures are sent to the fuel feed regulator and to the air volume regulator respectively.

Now for the drive on the stoker, we have chosen a constant speed motor with variable speed transmission. The transmission is of such a design that a given position of the lever will result in a certain speed, and for every position of the lever there is a certain definite speed produced on the driven pulley.

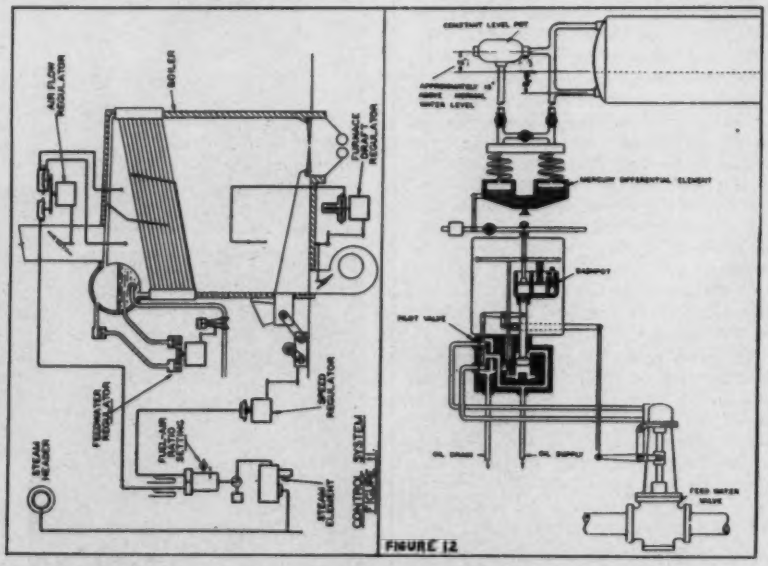


FIGURE 12

Thus, since the underfeed stoker is a positive displacement device, the amount of coal which it supplies to the furnace is directly proportional to its speed. Therefore, for this application, it is perfectly satisfactory to use a positioning type of regulator, since

THE PURE

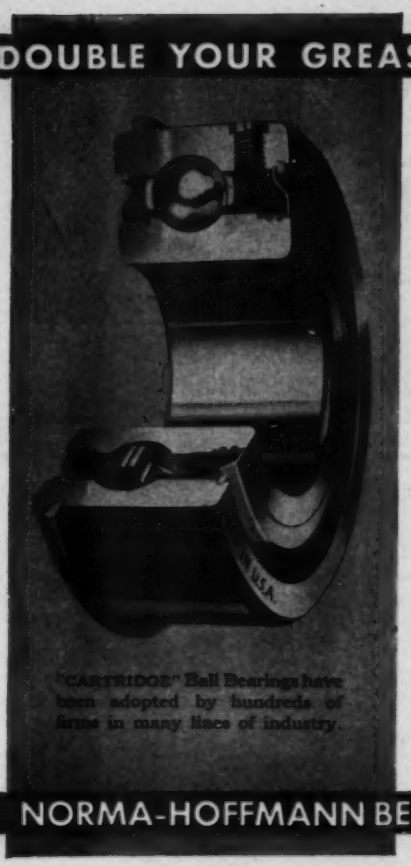
PURE THREE POINT LUBRICATION
A Complete Line of Industrial Petroleum Products

PURE OIL COMPANY

A Pure Oil engineer will help solve your lubrication problems. Write today.

PURE OIL CO.
CHICAGO U.S.A.

DOUBLE YOUR GREASE CAPACITY—SIMPLIFY DESIGN—with



"CARTRIDGE" Ball Bearings have been adopted by hundreds of firms in many lines of industry.

"Cartridge" Ball Bearings

(Patented)

SOME OF THEIR ADVANTAGES:

Can be packed with at least 100% more grease than any self-sealed bearing — especially adapted, therefore, for continuous service for long periods.

Provide positive protection against foreign matter and absolute retention of lubricant—by the use of flanged metal shields, recessed inner ring construction, and two or more grease grooves—the combination affording a truly effective labyrinth.

Are equally efficient in retaining grease in horizontal or vertical position.

Metal shields, though rigidly locked by snap rings, are removable to facilitate inspection, cleaning or re-greasing of bearings.

Can be quickly regreased, either through "built-in" refilling plug opening or by removing metal shields.

Require no lock nuts on shaft or clamping means in housing, because of wide contact areas due to double-row width of both rings —which also prevent "cocking", slippage or "peening".

Reduce costs by simplifying design, eliminating protective closure parts, and saving attendant labor.

Available with shoulder ring, thus permitting a through bore in housing, the shoulder ring providing endwise location.

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

Write for Catalog F-951 on Cartridge Precision Ball Bearings

. . . and that's the Oakite way to clean screen plates

Would you like to know about two SAFE, easy ways to clean screen plates . . . methods that successfully help many mills save time and money?

Simply soak plates in solution of recommended Oakite material as directed and rinse off. Dirt, slime and other deposits are completely yet SAFELY removed. Another successful method . . . steam cleaning . . . also enables you to do the work at marked savings in time and effort. Write for FREE 20-page booklet giving details on these and 26 other maintenance jobs.

Manufactured only by

OAKITE PRODUCTS, INC., 16 Thames St., NEW YORK, N. Y.

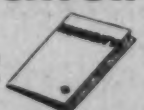
Representatives in All Principal Cities of the U. S. and Canada

OAKITE *Certified* CLEANING

BETTER REGISTER!

The Cambridge Printers Moisture Indicator tells you at a glance whether or not the moisture content of the paper and the relative humidity of the press room are in equilibrium. Only when they are, is paper ready for the press irrespective of how long it has been hung. With this instrument you don't guess, you know.

CAMBRIDGE PRINTERS MOISTURE INDICATOR



Send for complete details of this instrument. It will save you money in spoiled paper and enable you to be sure of better register.

CAMBRIDGE INSTRUMENT COMPANY, Inc.

3732 Grand Central Terminal New York City, N. Y.

ENGLISH ECCO CLAYS TRADE MARK CLAYS

UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

each position of the regulator produces a definite speed of the variable speed transmission driven pulley which, in turn, produces a definite speed of the underfeed stoker ram. The cam of the regulator will be cut so as to match the characteristic of the air volume regulator.

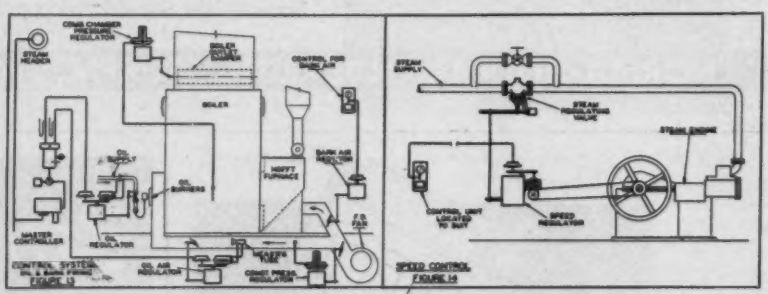
The air volume regulator will control the boiler outlet damper to maintain the volume of waste gases in direct proportion to the amount of coal being supplied.

Then, in order to maintain constant furnace draft, that is, constant overfire draft condition, a measuring type of regulator will be used to control the discharge damper on the constant speed forced draft fan. This regulator will maintain the overfire draft at a constant value at all rates of combustion.

There is one more function of boiler operation which must be controlled and that is the rate of water supply to the boiler. We will apply a measuring type of regulator, equipped with a mercury differential element for operating the feed water supply valve to the boiler drum. The arrangement of this type of regulator is shown in Figure 12, which indicates an oil-operated regulator with oil supply and drain.

Here the power cylinder is mounted directly on the feed water valve and the feed water valve piston rod is linked to the left-hand side of the weighbeam. Thus, if there is any deviation from the set level, the mercury will flow to one side or the other of the mercury differential element, causing the regulator to move the multiplying valve which, in turn, sets the power cylinder in motion. The stabilizing element will prevent overtravel of the unit.

Now, let us consider the application of regulating equipment to an oil-fired boiler equipped with a Hofft furnace. We will arrange this control equipment so that the



return motion of the regulator so that the feed water valve position corresponds at all times to the amplifier position of the regulator.

This type of feed water regulator is equipped with a special stabilizing element which incorporates a so-called Picard spring dashpot instead of the ordinary single element type of dashpot. This type of stabilizing element is required because of the storage capacity of the boiler and its tubes, and is necessary to obtain complete stability.

The measurement of feed water level is made by means of a mercury differential element, consisting essentially of a large U-tube mounted on a fulcrum. One leg of the U-tube receives pressure from the constant level pot in which a constant head is maintained on one side of the mercury differential element. The other leg of the mercury differential element is connected to the lower portion of the boiler drum and receives pressure in proportion to the level of water in the drum. Thus, any change in level in the drum causes a change in static head on the right-hand leg of the mercury differential element and causes the mercury to flow from one side to the other which unbalances the mercury differential element. The level which it is desired to maintain is controlled by the weight shown on the

burning of the bark in the Hofft furnace is controlled manually and the fuel-oil and the air for burning it are supplied to the boiler in proper quantities to maintain constant steam header pressure. This arrangement is shown in Figure 13.

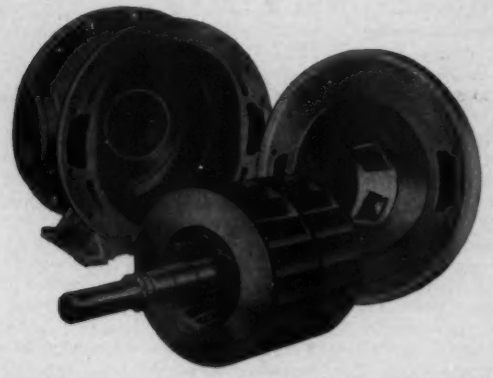
We will use a master controller which will consist of a reset type of regulator. This reset type of regulator will send air loading pressures to an oil volume regulator and an oil-air volume regulator for controlling forced air in proportion to the quantity of oil being burned. These two regulators will receive their master loading impulses from the reset regulator. Mercury indicating gages will be provided on the master controller for indicating the loading pressures to the oil regulator and the oil-air regulator of this group. In this case, each of these regulators will be of the measuring type in which a master loading pressure is balanced against a differential pressure, the differential pressure being a function of the quantity being controlled. That is, the differential pressure will be obtained from a measuring element located in the oil supply line in the case of the oil volume regulator, and in the forced air duct to the oil burners in the case of the air volume regulator. The forced air fan will be equipped with a constant pressure regulator which will maintain a constant forced air

PULP BLEACHING COMPANY

WAUSAU
WISCONSIN

CELLULOSE PURIFICATION

SIMPLICITY



NASH VACUUM PUMPS HAVE ONE MOVING PART

Operating advantages made possible by the Nash principle, and present in no other type of vacuum pump, permit a new level of operating economy. Nash Vacuum Pumps have but one moving part, a rotor cast in one piece, and revolving without metallic contact. There are no valves, no pistons or sliding vanes, no internal parts requiring wear adjustment or lubrication.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

No. 50-B
TOILET WINDER

A new high in.. TOILET TISSUE PRODUCTION

Our new 50-B winder operating at a sheet speed of from 1200 to 1400 feet per minute. Hard or soft rolls, perfect perforation, sheer cut slitters and perfect roll formation. Equipped with core cutter built in machine, new collapsible core shafts and new counter with automatic stop. Users are making new records in production.

HUDSON-SHARP
MACHINE CO • GREEN BAY • WIS

MASTER CRAFTSMAN

At Shrinking Orr Felts

On the most modern felt fulling mill in the world, this craftsman is shrinking an Orr Felt to the correct size. A standard operation in felt manufacture, this process requires eagle-eyed supervision, for shrinking a felt as much as one-half in size is a task where a mistake means ruin.

Only long time operators with years of apprenticeship are permitted to handle the shrinking operation—one of the reasons Orr Felts always meet exact specifications for quality and size. Next time, specify Orr Felts, get the benefit of long felt life and maximum water removal.

Orr Felt & Blanket Co.
PIQUA, OHIO

pressure in the common duct to the oil burners and also to the bark burning furnace. This constant pressure regulator will be of the measuring type in which a diaphragm measuring the pressure is balanced against a spring to maintain the desired constant pressure.

The forced air supply to the bark burning furnace will be controlled by a positioning regulator which will receive a loading pressure from a small air pressure sending device equipped with pressure gage. By means of this air pressure sending device, the operator may send an air pressure to the positioning regulator which will in turn place the damper on the inlet to the bark burning furnace at any desired position. The boiler outlet damper will then be controlled by means of a combustion chamber pressure regulator. This will be of the measuring type, in which the force on a diaphragm created by the combustion chamber pressure is balanced against a spring by means of which the combustion chamber pressure can be set.

Thus, at all times, the combustion chamber pressure will be maintained constant regardless of the products of combustion being generated by the oil burners or by the Hofft furnace.

In the event that there should be a demand for more steam, the steam header pressure will tend to drop and the master controller will increase the air loading pressure to the oil volume regulator and to the oil-air volume regulator. These regulators will open in the correct proportion to supply measured quantities of air and oil to the burners. At the same time that the oil-air volume regulator acts to open the air damper to the oil burners, the pressure in the common air duct will tend to drop. Immediately the constant pressure regulator on the forced air fan will operate to maintain the common air duct pressure constant. Thus it will not be possible for the oil-air volume regulator to rob air from the bark burning furnace.

We have deemed it advisable to recommend a positioning regulator for the damper on the bark burning furnace. Another method of handling this application would be to put a measuring regulator on the damper to the bark burning furnace and send a master air loading pressure from the small hand loading unit in order to maintain a set forced air pressure under the grates of the Hofft furnace. This has one disadvantage, however: if the supply of bark becomes depleted, or for any reason is shut off, the measuring regulator will act to maintain the desired constant pressure under the grate of the Hofft furnace, and since all of the fuel will have burned off of the grate, this regulator may open the damper wide in an attempt to maintain the desired pressure under the grate. This may rob the air from the oil burners, due to the fact that the forced air fan may not have sufficient capacity to maintain the desired pressure under the grates of the bark burning furnace when these grates are bare.

Accordingly we deem it advisable to make this regulator one of the positioning type so that it is possible for the operator to set a damper position, rather than to set the hand loading unit for a constant pressure under the Hofft furnace grate.

As the products of combustion are generated, the combustion chamber pressure regulator will operate the boiler outlet damper so that it opens or closes, as the case may be, to maintain the combustion chamber pressure constant at all rates of combustion.

In the past few years we have had the privilege to apply our control system to some of the latest types of recovery boilers of both the Tomlinson and Murray-Waern design. In all cases, however, these systems have been only partial control systems. We have equipped the units with furnace draft regulation to maintain constant combustion chamber pressure at all times, similar to the application of combustion chamber pressure regulation on steam power boilers. We have then equipped the forced air fan with a positioning regulator which can be loaded or controlled from a small remote control unit located at the operating station of the unit. Thus air loading pressure is set by means of the manual pressure sending device so as to maintain a damper position at any point which the operator may desire. The combustion chamber pressure regulator then maintains the combustion chamber pressure constant at all rates of combustion.

There is another application for a measuring regulator of a very high-grade type in the control of paper machine speed. We have made several installations of this type in recent years; however, no two of these regulating systems are exactly alike. This is primarily due to the large variety of paper machine drives now in use.

In this system of speed control, we make use of our standard measuring type of regu-

THE DRAPER FELT

Unexcelled for strength, openness, resiliency, and general running qualities. Made to meet the most exacting conditions on all types of machines and all kinds of papers. Only one grade and that the highest.

Made by

DRAPER BROTHERS COMPANY
CANTON, MASS.

Woolen Manufacturers Since 1856

REPRESENTATIVES

L. H. BREYFOGLE, Kalamazoo, Mich.
W. L. CAMPBELL, Savannah, Ga.
C. K. BEECHER, Delaware, Ohio
O. J. LELOFF, Vancouver, Wash.

SAVE
Time and Labor
SAFEGUARD
Valuable Rolls of Paper

With Stanley Strapping Equipment one man is able to tighten, cut and seal strong steel bands around a roll of paper. And, do it so easily and quickly that no other *secure* method can approach this for economy.

Stanley Strapping also saves money by safeguarding valuable rolls of paper in stock and in transit. The flat bands and seals cannot injure the paper.

Stanley offers both Flat and "Laytite" (Concave) Strapping. Also a complete range of strapping tools. A Stanley engineer will be glad to advise you about the best equipment to handle your shipping units. It will pay you to investigate. Write to Steel Strapping Division, The Stanley Works, 142 Lake St., New Britain, Conn.

STANLEY
TRADE MARK

Stanley "H" Tightener

Stanley "R" Tightener with Roll Attachment

Stanley "L" Sealer

The STANLEY STRAPPING SYSTEM

COMPLETE FACILITIES AVAILABLE

You are invited to use Our Technical Service

on

STARCHES

GUMS

SYRUPS

DEXTRINES

★

STARCH
FOR ENZYME CONVERSION

AMIJEL
FOR THE BEATERS

LAM-O-DEX
FOR LAMINATING

COR-A-GUM
FOR CORRUGATING

For further information write

CORN PRODUCTS SALES CO.

17 BATTERY PLACE
NEW YORK CITY

lator with remotely located pressure sending elements. This small pressure sending element is located on the operating floor in a convenient position for the use of the paper maker. This sending unit dispatches an air loading pressure to a measuring type of regulator in which the air pressure is balanced against a hydraulic type of speed governor element. This element is of a rotary centrifugal type and is highly sensitive in a speed range of approximately 10 to 1. That is, the governor can go to one-tenth of its maximum speed and still maintain fairly accurate speed regulation. The pressure sending unit can be calibrated in revolutions per minute, or in feet of paper per minute, or in any way that may be desirable or convenient for the operator.

Thus, by setting the remote control element to maintain any desired air loading pressure, the operator is, in effect, controlling the exact paper machine speed called for by that particular master loading pressure. In the regulator, the master loading pressure is balanced against the sensitive speed governor and this force balance is then applied to the power portion of the regulator. The regulator then can operate a steam valve for controlling a steam engine or rheostat for controlling a variable speed motor, or, on recent installations, can be used for controlling a hydraulic coupling or electric coupling, as the case may be. Thus, for a constant master loading pressure, the slightest tendency for the machine to change its speed is immediately counteracted by the regulator and the speed is maintained constant until the operator sees fit or necessary to change the speed by resetting the remote control element.

These paper machine speed regulators may be of the air-operated type or of the oil-operated type, depending on the power medium available at the plant under consideration.

Figure 14 illustrates in simple diagram form the elements involved in a speed control of this type.

At the present time we are studying the design of a tension regulator to accurately control the tension as actually measured in the paper. We have applied our system with some success in the woolen industry, where we have accurately controlled the tension of the warp where it is being reeled for the loom. We feel that with certain modifications, this system may well be adapted to the paper industry.

Air Conditioning from a Practical Angle

J. L. MULLIN, General Manager
Hopper Paper Company

It is my belief that the time will come when we will all be striving to manufacture and market a sheet with a moisture content equivalent to about 40 per cent relative humidity at about 75 deg. dry bulb temperature and it will be absolutely necessary that the dry bulb temperature of the sheet be in equilibrium with the surrounding temperature of the controlled room as it leaves the machine. To attain such conditions it would necessitate very accurate thermostatic control of the water in the cooling and calender rolls.

In observing the behavior of paper as it comes from the paper machine and into the controlled room for cutting, trimming and packing, I find that it is quite impossible to calculate just how much moisture by volume it is necessary to leave in the finished sheet unless the sheet is cooled down to the temperature of the controlled room. I have at times found a loss of as much as 2 per cent as the paper is cooled down from 95 deg. to 75 deg. or a loss of 20 deg. dry bulb.

We strive to maintain a 3½ per cent moisture content by volume in a sheet at 75 deg. Fahr. for a room controlled at 75 deg. dry bulb, 61 deg. wet bulb and a relative humidity of 43 to 44 per cent.

With the paper made to specifications, it is necessary to turn our attention to the operations in the controlled room to avoid spoiling the paper that has already received a lot of attention. For accurate control of a conditioned room, special attention must be given to the construction, lighting, refrigeration, laying out of the duct work to avoid air drafts, etc.

Our equipment consists of a 2000 gallon square tank, well insulated all around. This tank acts as a storage reservoir for water at 34½ deg. Fahr., which is used for dehumidification. The water is drawn from near the bottom and at one side of the tank by a centrifugal pump and is circulated through a cooler and returned to the tank near the top at the opposite side from the suction pipe. The cooler is connected to two compressors of ten tons each, using Freon as a refrigerant, which holds the water as before stated at 34½ deg. The conditioning unit consists of air inlet sec-

APPLETON
WIRES
are Good wires
Appleton Wire Works, Inc. Appleton, Wis.

DE-INKING

Oxford Pulp Process for De-inking of waste paper made from Chemical pulp.

Sterling Process for the De-inking of news.

Continuous cold water processes. Low conversion costs, small loss of fiber with no loss of strength.

Write for particulars

AMERICAN INDUSTRIAL COMPANY
American Industrial Building
631 Niagara Street — Buffalo, New York

Sack Machine Adjuster: Steady work, good pay. In reply state age, years experience, and make of machines familiar with. Address Box 302, Fritz Publications, Inc.

WANTED: A set of pique design embossing male and female rolls in 42" to 53" width for Waldron or similar type embosser. Address Box 303, Fritz Publications, Inc.

FOR SALE: Garment Bag Machine. Potdevin Slope-Shouldered Bag Machine equipped with two color printer. Now in full production and in first class condition. Price attractive for buyer who can take delivery at once. Address Box 304, Fritz Publications, Inc.

NOW READY! NEW EDITION FOR 1940!

The Paper Makers' Directory of all Nations

The Red Book of the British Paper Industry
Alphabetically arranged—Printed in Clear Type—Demy octavo—Cloth bound.
Price 25/—net: or Post Free 27/—Sterling.

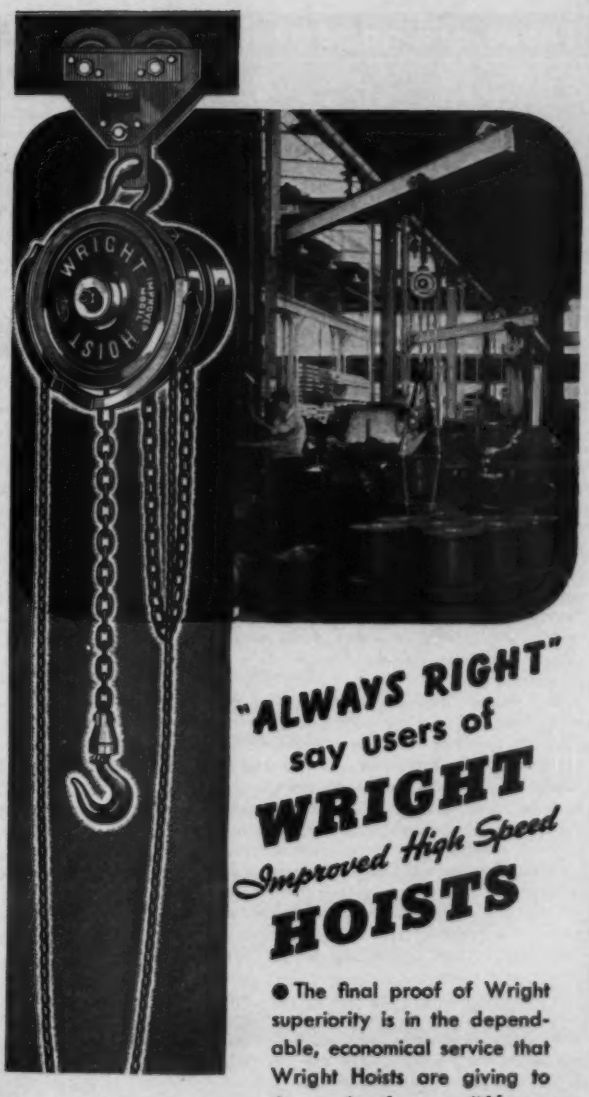
DEAN & SON, Limited
41-43 Ludgate Hill — London, E.C. 4, England

TRIMBEY MACHINE WORKS
GLENS FALLS N.Y.
PULP SCREENS
WEIGHT AND CONSISTENCY REGULATORS
METERING SYSTEMS — FLOAT VALVES

Pulp and Paper Mill Screens

of STAINLESS STEEL—COPPER—BRONZE—MONEL—CHEMICAL RESISTING ALLOYS
Perforations that are accurate in size and alignment
ANY METAL • • ANY PERFORATION

The Harrington & King PERFORATING Co.
5654 Fillmore St., Chicago, Ill., • 114 Liberty St., New York, N.Y.



"ALWAYS RIGHT" say users of WRIGHT Improved High Speed HOISTS

● The final proof of Wright superiority is in the dependable, economical service that Wright Hoists are giving to thousands of users. *"Always Right"* would well summarize the opinions of these users of Wright Hoists in capacities from ¼ to 50 tons.

There are 21 definite points of Wright superiority—such as precision load wheel bearings which provide fast, smooth, positive action—full zinc coating to resist corrosion—Wright safety guard that always keeps the load chain in the pocket, regardless of operating position.

Write for the Wright Catalog, describing the many advantages of Wright Hoists, Cranes and Trolleys.

BUY ACCO QUALITY *in Wright Hoists, Cranes and Trolleys; Tru-Lay Preformed Wire Rope; Reading-Pratt & Cady Valves; Campbell Abrasive Cutting Machines; American Chains; Page Welding Electrodes and Page Wire Fence.*

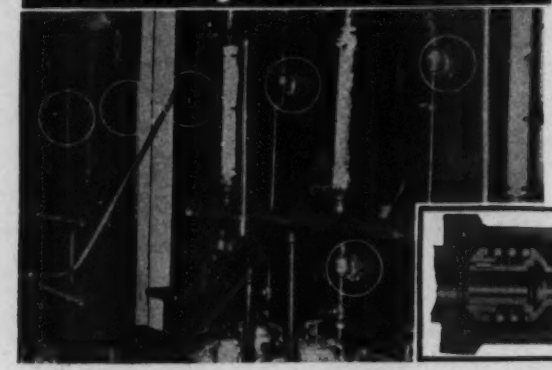
WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

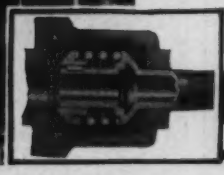
ACCO
In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

These are good stairs — but —

THEY WON'T BE NEEDED NOW!





• At least no one will need to climb them for inspecting, packing, oiling and adjusting the stuffing boxes; for this is one of the many paper machines where Johnson Rotary Pressure Joints have ended stuffing box troubles. The sectional view shows the basic construction of these Johnson Joints. Two special, self-lubricating carbon graphite rings form the bearings and pressure seal. Sealed by the pressure, they are self-adjusting. Equally important is the ball and socket design and the annular space around the outlet which provides for angular or lateral misalignment —greatly increasing joint life. There is a Johnson Joint for every machine with every type of drainage—a joint that will save time, power, and step up production. Ask for latest bulletins.

THE JOHNSON CORPORATION

845 WOOD STREET — THREE RIVERS, MICH.

tions, spray chambers, reheater section, filter section and fan.

The fan discharges into the duct system which distributes the conditioned air evenly throughout the space to be served.

For dehumidification, the cool water, circulated as previously described, is forced through space to a pan holding approximately 100 gallons of water, from which the overflow returns to the storage tank and is recooled.

If a higher humidity is demanded, the humidistat closes a three-way valve, shutting off the cool water and recirculating the water in the spray pan. At the suction intake of the pump in the return water is a steam injector which heats the water to the desired temperature, or until the humidistat is satisfied. The controls are operated automatically by air furnished by a small compressor capable of producing 20 lb. pressure, which is controlled by a thermostat and a hygrostat and acts upon various diaphragm valves controlling temperature, water, and steam.

The compressors are electrically controlled by Powers immersion thermostats with 38½ deg. maximum and 34½ deg. minimum temperatures, and are also subject to controls which operate when pressure changes occur.

The space conditioned by the above described equipment is 85 ft. long, 30 ft. wide and 12 ft. high. The area is enclosed in a wood frame partition with ½ in. of Insulite on each side of the walls and ⅛ in. hard board on the inside to prevent sweating at high humidities. The ceiling is insulated with Insulite and hard board on the inside and 4 in. of Rock Wool bats on top.

In calculating the refrigeration necessary to control the room, allowance was made for approximately ten employes, twenty-four fluorescent lamps of the Cooper-Hewitt type, heat from necessary motors, etc.

With all the equipment as described in this paper, we can cut, trim, count and pack paper in moisture-proof wrappers that will lie perfectly flat and behave well in the controlled printing plant. However, our troubles are not yet over, it is not only necessary to build a sheet of paper that will behave well in the printing plant, but it must also behave well after reaching the consumer.

Some mills today are selling paper for special jobs and guarantee that the paper will not curl under any changes of temperature and relative humidity because they make their paper from special inert fibers.

I have from time to time procured several of these so-called inert sheets and have hung them around in various places where there are very serious changes in temperature and relative humidity. In nearly all cases where the relative humidity was too high, the sheets would curl toward the wire side across the grain, and if the atmosphere was too dry it would curl with the grain toward the felt side of the sheet.

Paper Sorting by Machine

WALTER S. REED
Dexter Folder Company

Time and motion studies of girl sorters indicated that the process of hand sorting comprised the following fundamental elements:

1.) One pair of eyes
2.) One pair of arms
3.) One pile of paper
4.) A certain hour rate of pay—which currently seems to average 40 cents.

From our studies it became apparent to the research engineers that:

a.) A pair of human eyes, as contrasted to the electric eye in its current stage of development, was a prerequisite in the development of the mechanical sorter.
b.) A pair of arms was wholly essential.
c.) A sheet could be inspected in motion within certain limits of sheet speed.
d.) Most imperfections—over 90 per cent —could be observed by one side sorting.
d.) Only one-third of the girls' "eye time" was spent actually inspecting paper, with two-thirds consumed in the operations of handling the sheets, spatting, straightening, etc.

The engineers visioned a combination equipment to take a pile of paper five feet high from the cutters, automatically feed each sheet to a sorting table, count and jog the good sheets as well as reject and jog the imperfect sheets. This would concentrate all of the girls' attention on inspecting the sheet. She would do nothing with it except to let it go through to a pile delivery if it was a good sheet, or by a simple turn of a tripping mechanism located right near her hand, reject the sheet if it happened to contain imperfections.

We therefore designed the present sorting machine, which has been undergoing tests in both coated paper and bond mills. It consists of an automatic stream feeder; a sorting table; a reject mechanism with a jogging delivery for imperfect sheets; and a jogging pile delivery and counter for perfect sheets.

The next factor which bothered us for a time was the speed of the sheet at the point of inspection. Fortunately, a new method of feeding sheets had originated whereby a very high rate of speed could be maintained at the feeding point, which rate was reduced to one-fifth of that speed at the point of inspection by the underlapping of the sheets being fed, with the rate again accelerated to full speed at the delivery point.

The sheet travel at point of inspection is at the rate of only 1,000 sheets per hour. The rate of sheet travel per square inch of area surveyed is no more than with high speed hand sorting. The eyes of the inspector are utilized to their maximum capacity for sorting only. The machine brings the sheet to the inspector; permits it to be surveyed over its entire surface while moving at a very low rate of speed, and counts, delivers, and jogs it at a high or the feeding rate of speed.

This system of machine sorting means that the average mill can obtain four to six times the output of a hand sorter and at least twice the output of mechanical sorters now on the market. It reduces damage and waste, particularly on very large sheets which are being demanded more and more because of the trend towards bigger presses. It enables a better concentration and utilization of the floor space in the average finishing room. It likewise gives an automatic "time study" or "paced" operation analogous with the measured work day as a better control factor in finishing rooms. Furthermore, by blowing air into the pile as the sheets are being fed, the stock is aerated, which helps in the seasoning process and in the equalization of the moisture content, at the same time eliminating a portion of the paper dust. Primarily, to the printer, mechanical sorting means that the mill paper has been pre-fed on an automatic feeder.

EDITOR'S NOTE: Publication of abridgments of papers presented at the fall meeting of the Technical Association held in Seattle, Wash., August 13-16, will be continued in the next issue. The first installment of them appeared in the September issue.

GLENS FALLS
MACHINE WORKS, Inc.
Glens Falls, New York

Manufacturers of—

Improved Rogers and Special Wet Machines

Standard Wet Machines

Glens Falls Rolling Action Flat Screen

The A. D. Wood Saveall, Thickener, Washer and Water Screen

Glens Falls Decker and Decker Washer

Glens Falls Rotary Sulphur Burner

Pulp Grinders, Three or Four Pocket

Write for descriptive literature.

Many times we have been asked, "When will you be ready to deliver your 'own design' of modern Score and Shear Cut Slitters and Winders?" The answer is NOW, for we have arranged offices, manufacturing facilities and showrooms in Downingtown, Pa. We would like to show you, either personally or by mail, how different a familiar type of machine can be.

JOHNSTONE
Engineering & Machine Co.
DOWNINGTOWN, PA.

TAKE A

LOOK

6 PUBLICATIONS FOR PAPERMAKERS

Pulp Bleaching	$0.50
Technology of Papermaking Fibers	.50
Spots and Specks in Paper Murray M. Rubin and Milton L. Rubin	.50
Lessons in Paper Making—Part 1 Harry Williamson	.50
Lessons in Paper Making—Part 2 Harry Williamson	.50
Drying of Paper on the Machine B. M. Baxter	1.00

Now available postpaid from

FRITZ PUBLICATIONS, INC. 59 E. Van Buren St. CHICAGO, ILL.

BUY GUARANTEED REBUILT
POWER EQUIPMENT

Save 50% the cost of new. . . . Get equipment guaranteed "same as new". Select wisely from Chicago's largest, most complete stock. Write for complete information.

CHICAGO ELECTRIC CO. 1327 W. 22nd St., Chicago, Ill.

★ CONSTRUCTIVE ARTICLES
★ SELECTED NEWS • FEATURES
THE PAPER INDUSTRY AND PAPER WORLD

WATERBURY FELTS

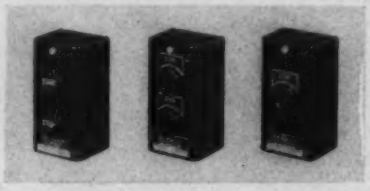
Are Made By

H. WATERBURY & SONS CO.
ORISKANY, NEW YORK

NEW EQUIPMENT AND SUPPLIES

Push-Button Stations

A new line of one- and two-button standard duty push-button stations has been announced by the General Electric Company, Schenectady, N. Y. The new stations are 4 9/16 in. high, 2⅜ in. wide, and 2½ in. deep. They are protected from accidental operation by guard rings. Mounting holes are in the upper left hand and lower right hand corners. The contacts are of fine-silver backed by steel. A full ¼ in. gap on each contact is obtained on both the "Start" and "Stop" button.



Portable Acetylene Generators

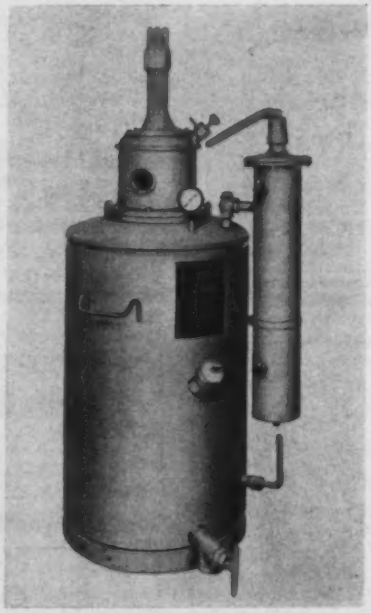
Marquette Manufacturing Co., Minneapolis, has announced four new portable acetylene generators, individually designated as No. 512, 515, 530, and 550, for use in acetylene welding.

No. 512 has a 12 lb. carbide capacity, 12 gallon water capacity, stands 40 in. high, weighs 95 lb. and produces 24 cu. ft. per hr. No. 515 holds 15 lb. of carbide, 17 gal. of water, is 50 in. high, weighs 96 lb. and delivers a maximum of 30 cu. ft. per hr. No. 530 has a capacity of 30 lb. of carbide, 33 gal. of water, is 61 in. high, weighs 123 lb. and produces 60 cu. ft. per hr. No. 550 holds 50 lb. of carbide, 55 gal. of water, stands 69 in. high, weighs 177 lb. and delivers up to 100 cu. ft. of acetylene gas per hour.

All models, except No. 512, are listed by Underwriters' Laboratories Reexamination Service.

Among the advantages, cited by the manufacturer for these generators, are the following:

Pressure held to within two ounces of pre-determined setting.



Operation automatic after release cap at top of generator is given simple twist to begin operation.

Small observation window permits quantity of carbide remaining in hopper to be observed.

Constructed under latest and most exact insurance company standards.

Solder in Powder Form

Colonial Alloys Co., Philadelphia, has announced a solder, known as *reaction solder,* which is in the form of a powder containing a combination of selected electro-positive metals and chemicals that react with the metals joined by it. The types of work that can be handled with this solder are not restricted. Its use depends only on the application of relatively low heats from torch, flame, oven, soldering iron, etc. Iron, steel, stainless steel, copper, bronze, nickel, tin, aluminum alloys, monel, brass and other metals, according to the announcement, can be joined with this material.

Head and Face Protector

Industrial Products Company, 809 West Somerset St., Philadelphia, Pa., has announced the development of a protector that offers complete coverage to face, head, neck and shoulders. The frame is of lightweight aluminum; the front (replaceable),

of transparent acetate and of a size offering full vision in all directions; and the hood and cape, of Neoprene. The cape is full cut so that the mask may be thrown up over the head when wearer is not exposed to the hazards, such as splashes and sprays of acids and alkalies.

Portable Potentiometer-Pyrometer

A portable potentiometer-pyrometer, designated as *Model 70-PO,* has been announced by J-B-T Instruments, Inc., 441 Chapel Street, New Haven, Conn. The instrument, designed for measurement of temperatures by thermocouples, can be used under ambient temperature conditions of

minus 40 (—40) deg. to plus 120 deg. Fahr. The 6¾ in. temperature scale may range from minus 50 (—50) deg. to plus 50 deg. Fahr. up to 0 —3000 deg. Fahr. Each scale is drawn to customer's requirements. Temperatures varying at such a rate that total scale is spanned in ten seconds can be followed. Guaranteed accuracy for the instruments is ½ of 1 per cent total

Save POWER COSTS

Recent Rodney Hunt Modernization of water power equipment for paper mills has produced power savings that are paying 30 to 50% yearly dividends on their cost. THAT'S MODERNIZATION THAT PAYS!

It will pay you to get the facts, find out what has been done by other mills, and what you can do to reduce power costs in your own plant.

Rodney Hunt has pioneered in water power equipment "from dam to Tail-race" for more than 70 years, has exclusive patented features that will save you money. Write for New Catalog No. WW40.

WATER WHEEL DEPT.

RODNEY HUNT MACHINE CO.

15 Water Street Orange, Mass.

Performance
Low Operating Cost

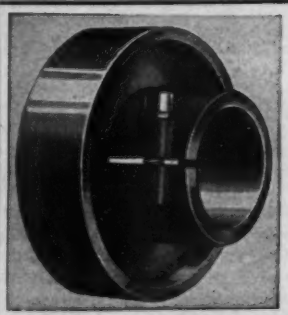
DOUBLE CHECK
THESE ADVANTAGES
IN

Roots
CONNERSVILLE
VACUUM PUMPS

IN HANDLING AIR AND GAS
Experience Counts

It all adds up to this—lower production costs per ton of paper. May we present the complete facts in the case?

ROOTS-CONNERSVILLE BLOWER CORP.
410 Monroe Ave. - Connersville, Ind.



KOEGEL
SPECIAL CLAMP
LOWER SLITTER

Single or Double
Cutting Edge

CHARLES KOEGEL'S SONS, INC.
Holyoke, Massachusetts, U.S.A.

COLORS . . .
for Board and Paper

Green Chromium Oxides
Black, Brown, Red, Yellow Iron Oxides
Lamp Black—Umbers—Venetian Reds—Yellow Ochres

C. K. WILLIAMS & CO.
Easton, Pennsylvania

Checking wire diameter down to the finest of tolerances in order to insure correct mesh openings is one of many important precautions taken at Lindsay.

There is No Skill Apart from Care

Men may have a natural aptitude for their jobs. We believe that our own men have. But, frankly, if Lindsay workmen deserve the name of craftsmen, it is even more because they have learned long since the imperative need for an all-embracing care. The processing of Fourdrinier wires at Lindsay is watched over with an amount of painstaking that is almost incredible. The persistent use of micrometer and microscope is typical. » » On these details of alertness and accuracy Lindsay policy has never varied since the beginnings of the company thirty-seven years ago.

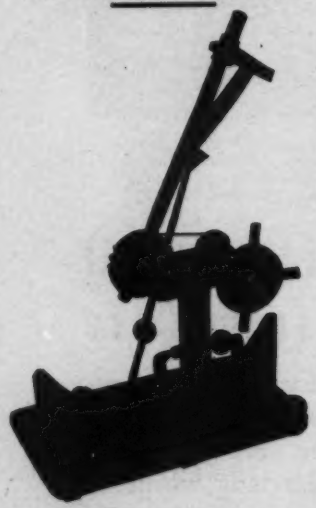
THE LINDSAY WIRE WEAVING CO.
Serving the Paper Industry Since 1903
[illegible]-4299 ASPINWALL AVENUE • CLEVELAND, OHIO

Lindsay WIRES
FOR PAPER MILLS

Trifles Make Perfection But Perfection Is No Trifle

GURLEY PAPER TESTING INSTRUMENTS

For Testing Porosity—Stiffness—Smoothness—Softness—Sizing—Shrinkage—Curl



The Gurley R. D. Stiffness Tester

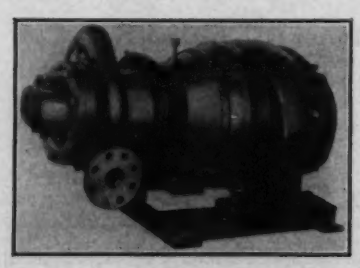
tests any paper from tissue to bottle cap. Simple, sensitive and accurate. Described in Bulletin No. 1420.

W. & L. E. GURLEY
TROY, N. Y., U. S. A.

scale deflection. The instrument, weighing less than 5¼ lb., is housed in a 6½ in. x 7½ in. x 4 15/16 in. mahogany case. An aluminum case for flush switchboard mounting can be supplied on special order.

Pump Line Extended

Allis-Chalmers Mfg. Company, Milwaukee, Wisconsin, has extended its line of multi-stage *"SS Unit"* pumps by the addition of a two-stage, 4 in. suction, 2 in. discharge pump, rated up to 275 gpm against heads up to 500 ft. at a speed of 3550 rpm. The new pump, with motor and pump housing bolted together as in the other "SS Unit" pumps, has a cast iron



casing and cover, and is bronze fitted throughout. The impellers are placed back to back to provide axial balance. Inside parts of pump can be removed without disconnecting the suction and discharge piping. The stuffing box is subjected only to suction pressure. Pump can be furnished with either an open, splash-proof, totally enclosed or explosion proof motor.

Loose Pulley Oiler

A visible, unbreakable loose pulley oiler for slow and high speed loose pulley applications, without flooding, has been announced by Trico Fuse Mfg. Co., 2948 North Fifth St., Milwaukee. A copper tube transmits the heat of the pulley hub to the oil reservoir to produce thermal action; a wire reinforced wick feeds oil by capillary action; and the oil is dropped on the bearing by gravity. The oiler is available in one and two ounce capacities with ⅛ in. or ¼ in. pipe thread fittings.

Pulley Face Covering

A covering for application to the face of pulleys to prevent belt slippage has been announced by the Nonslip Pulley Covering Co., 777 Hertel Ave., Buffalo, N. Y. This product, designated as *Nonslip Pulley Covering*, is supplied in sheets containing nine square feet. To make an application, a strip of proper width and of a length sufficient

to go twice around the pulley, is torn from the sheet, soaked a short time in hot water, and then applied tightly to the pulley face. The pulley face should be clean before applying the covering. The manufacturer claims that a single application of the covering usually lasts a couple of years.

Torque Indicator Wrenches

Blackhawk Manufacturing Co., Milwaukee, has announced a line of torque indicator wrenches having maximum capacities of 133, 175, 420, and 1,000 ft.-lb. For small assemblies, the 133 ft. lb. wrench, the *Torkflash*, features a flashlight signal, pre-set tension and a choice of 7/16 in. or ½ in. socket drives. The three larger models have ½ in., ¾ in. and 1 in. socket drives, respectively. These latter wrenches feature a dial designated as *Stay-Set*, which magnifies deflection of an enclosed spring-steel shaft 26 times and which remains at maximum torque reading after tension is released. The dial is reset to zero by turning a center knob.

Watchman's Tour System

Dudley Lock Corp., 325 North Wells Street, Chicago, has developed a watchman's tour system which compels inspection of specific parts of a property at prescribed time intervals, and which can flash or permanently record the time of inspection and summon aid in emergencies. The system,

listed by Underwriters' Laboratories as approved equipment, comprises an arrangement of key stations with transmitting stations at start and finish of each series. The transmitting stations can actuate any kind of signal or recording apparatus. A special recording clock, made for the Dudley system by the Cincinnati Time Recorder Co., records, on a long roll of paper, the date and exact time each transmitting station is visited. An additional service is the delayed alarm, which gives a warning at any specified location when a transmitter box is not visited within a given time period. The watchman's tour key operates only on a predetermined route, and only in proper sequence. It has a built-in cyclometer which counts the stations and thus gives proof of completion of a specified number of tours.

Industrial Vehicle Tire

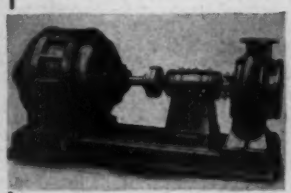
The B. F. Goodrich Company, Akron, Ohio, has developed a tire for wheelbarrows and other industrial vehicles that is filled with highly-resilient cushioning rubber. The tire, called the Goodrich Silvertown *Cushion-Type* Tire, has the construction and load-carrying capacity of a 4-ply pneumatic tire. It is available in the 16x4.00 and 16x2.00 sizes for wheelbarrows. The larger unit is designed to fit the lug base wheels of the same size single tube pneumatic tire, while a special wheel has been designed for the 16x2.00 size.

54 WARREN PUMPS

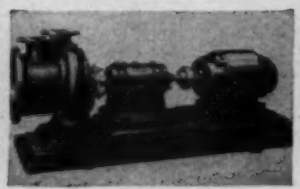
to be installed at the new Florida Pulp and Paper Company Pensacola Plant . . .

Why Warren? Because Warren paper mill pumps not only stay with their jobs and protect against costly service interruptions: they do their jobs, year after year, at consistently low operating and maintenance costs. For low pumping costs today and tomorrow, write Warren into your pump specifications.

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS



Warren Stock Pumps

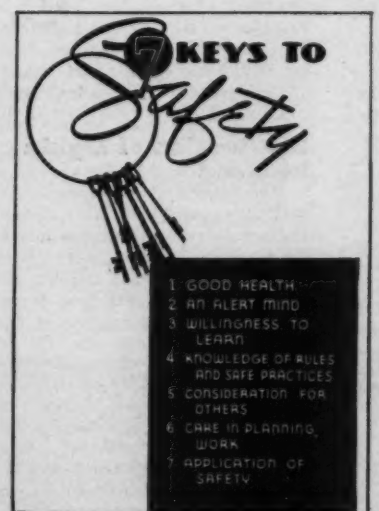


Machine Chest Pumps

Liquor Pumps

Centrifugal Fresh Water Pumps

WARREN PUMPS



Seven "keys" for the employee—but

5 of the 7 are

MANAGEMENT'S RESPONSIBILITY

- *Are you getting maximum cost reductions from your safety program?*
- *Does your program promote the best personnel relations?*
- *Have you adequate facilities for doing your part in "Safety for National Defense?"*

The National Safety Council offers complete assistance in organizing and improving your safety program. A special division—The Paper and Pulp Section—is concerned with your problems.

More than a quarter century of practical experience, as the recognized leader of the National Safety Movement, is your guarantee of effective help in your Safety work. To executives of all firms we offer the new revised edition of the booklet "Industrial Services of the National Safety Council." It tells how the Council serves thousands of firms and how it can help you. Write: PAPER and PULP SECTION

NATIONAL SAFETY COUNCIL, Inc.

20 North Wacker Drive Chicago, Illinois

TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

Fibrous Holocellulose

Continuing former studies (Cf. THE PAPER INDUSTRY AND PAPER WORLD, Aug. 1939, 604), the present authors have prepared larger quantities of beechwood holocellulose for testing purposes. The wood was soaked in a rubber-lined revolving drum, and the water drained off prior to the chlorination. Other treatments after chlorinating were washing with water, extraction with calcium hydroxide and repeated washing. This procedure was repeated (or modified) until a yield of 78.9% holocellulose with 2% lignin was obtained. A Jokro mill could be used to defiber the pulp. Bleaching until the lignin was completely removed resulted in a pulp whose whiteness corresponded to ordinary bleached pulps but with considerable loss in material. Using the German standard testing methods, beaten and unbeaten pulps were tested for strength. This was satisfactory and varied inversely with the lignin content. On beating, holocellulose develops strength properties rapidly without high power consumption, the rate being influenced by the lignin content. In photomicrographs, it appears that despite almost complete removal of lignin, bonding between the cells is still maintained. The cementing material appears to remain. Cell lumina are reduced in size. Chemical analyses of the wood and some of the holocelluloses are included. Satisfactory sheets from beechwood holocellulose can be obtained. K. Jayne and E. Kerler. Holz Roh-u Werkstoff 3, No. 1 2-7 (1940) through Bull. Inst. Paper Chemistry, 10, 411 (1940).

Printing Quality of Paper

The measurement of printing quality is discussed, together with the effect of smoothness on printing. Objections are raised to various smoothness testers. A method of printing quality which may offer possibilities involves an apparatus which by use of a photo-electric cell, will survey areas which are of the same order of magnitude as the areas of the paper which have not been inked. In these cases the amount of light reflected by uninked paper will be very high as compared with the light reflected by the total area under observation. Experiments are in progress along these lines in the Forest Products Laboratories in Canada. Oil absorbency and wettability of paper to oil are taken up briefly. The rate of penetration is of importance, since in newsprint the inks must penetrate before drying. If excessive penetration takes place however there is too much "show through" and possibly "strike-through". Rate of penetration of the oil at the surface of the sheet may be well measured by the Larocque tester. In newsprint however it is not sufficient to record the average time of absorption. Records should be made of deviations from this average at different points on the sheet. In inks drying by absorption the amount of oil which the paper can absorb is of importance since it must absorb practically all the oil, and this has a marked effect on the sheet opacity. Warren Beazley. Pulp and Paper Magazine Canada (Convention issue) 41, 117-22 (1940).

Chemical Pulp for Feeding Purposes

This paper shows the trend of research in Europe, along new lines. The author discusses the conditions under which chemical pulp can be utilized as a feedstuff, how it can be used and furthermore how to offset the lack of protein. It appears that digestion which leads to removal of those products which make for a high alcohol yield, furnishes a more digestible product than do ordinary sulphate or sulphite pulps. Horses and cattle can digest the pulp better than can pigs or rabbits. H. Edin. Svensk Papperstidn. 43, No. 8, 145-51 (1940) through Bull. Inst. Paper Chem. 10, 412 (1940).

Pulp Mill Wastes and Fisheries

Under this title, a recent abstract appeared, in Technical Developments of THE PAPER INDUSTRY AND PAPER WORLD, July 1940, 418, in which a few errors occurred that require correction. These have been discovered through the courtesy of Miss Edith Stroschneider of the Institute of Paper Chemistry, who had access to the original Swedish reports. The term "sea-water" should read "fresh water," which was taken from the freshwater Malar lake. The fish under observation included the fresh water perch, minnows, carp, pike, *et al*, as well as the salmon listed in the original abstract.

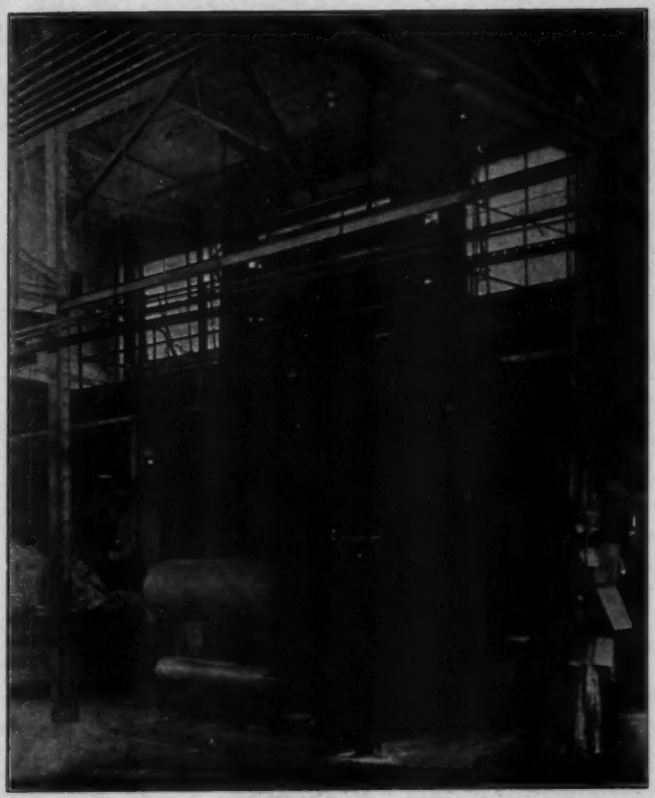
The reference to "soda wastes" is incorrect. This should read sulphite spirit wastes. Sten Vallin, and Hilding Bergström and Vallin. (cf. original abstract).

Chemically Modified Celluloses

The following are abstracts of two papers. Ozone reacting with cellulose in the presence of water attacks the material strongly and forms oxycelluloses which are characterized by very high copper numbers and relatively low (but increasing) methylene blue adsorptions. Ozone thus resembles acid oxidizing agents. Charles Dorée and A. C. Healey. J. Text. Inst. (Transactions) 29, T. 27-42 (1938). The effect of alkalis on the molecular chain lengths of modified cellulose was studied by fluidity measurements (fluidities are the reciprocals of viscosities). When cotton cellulose is nitrated in HNO_3-H_3PO_4 mixtures, and then denitrated with ammonium hydrosulphide, a degradation takes place. However this seems to be due largely to the denitration reactions. From fluidity measurements on nitrocellulose formed from oxycellulose, it was possible to differentiate between two types of oxycelluloses: (1) those prepared by the use of alkaline oxidizing solutions, giving rise to nearly the same relationship between nitrocellulose-acetone fluidity and cellulose-cuprammonium fluidity as that noted in the case of the hydrocelluloses; and (2) those prepared by neutral or acid oxidants, in which nitrocellulose fluidities are markedly lower than would be expected from cuprammonium fluidities. However, if oxycelluloses of class (2) are treated even with cold, feebly alkaline solutions, the fluidity of subsequently nitrated products increases greatly. All types of modified cellulose when heated with aqueous NaOH, give the same relationship between cuprammonium-cellulose fluidity and nitrocellulose fluidity. The relation between tensile strength and cuprammonium fluidity varies widely for the different types of oxycellulose, but is much more nearly the same when nitrocellulose fluidity is used in place of the cuprammonium fluidity. In the case of oxycelluloses prepared with neutral or acid oxidants, the cuprammonium fluidity gradually increases with time. No such increase was noted with hydrocelluloses or oxycelluloses prepared by alkaline oxidants. These experimental results indicate that oxycellulose obtained by the use of neutral or acid oxidizing agents retain, in their long chain molecules, linkages that may be readily broken down in alkaline solution. The author offers an ingenious working hypothesis for this hydrolytic cleavage, whereby the oxidized chain molecules are shortened after alkaline attack. This is based on work by Jackson and Hudson and by Evans and his co-workers, and must await further experimental confirmation. G. F. Davidson. J. Text. Inst. 29, T. 195-218 (1938).

Distribution of Lignin in Wood

Thin sections of wood (cross and tangential) were treated with 72% sulphuric acid, and warmed on a microscope slide. In some instances good patterns were obtained by first treating the wood sections with 3% iodine in KI solution. Such pretreatment seems to delay the swelling of the cells, giving an opportunity for the so-called "lignin pattern" to form as the cellulose is being dissolved gradually. There seems to be a good correlation between the cell-wall lignin pattern and lignification as indicated by staining with 1% aqueous safranine followed by a 1% light green alcoholic solution. When lignin patterns were observed in cross sections of wood, the pattern was radio-concentric. Exceptions were noted however in the case of compression wood tracheids and with some fibers of the dicotyledons. Whenever repeated attempts to obtain lignin patterns failed, the lignin content of the secondary wall was adjudged to be very slight. The thicker the cell wall, the better the chance of showing the presence of lignin. H. E. Dadswell and D. J. Ellis. J. Council Sci. Ind. Research 13, 44-54 (1940) through C. A. 34, 3490-1 (1940).



Here's How You Can Solve Your Finishing Problems

You can easily solve your paper finishing problems by consulting Norwood's Engineers. With a forty-four year record of helpful cooperation with paper mill men throughout the country Norwood's men have the knowledge and experience necessary to make helpful recommendations which will assure you of satisfactory results.

If you need new calenders or other finishing machinery—if you need your present machinery modernized to get better, faster production—if your machines need overhauling or repairing—then get in touch with Norwood today. You can depend upon Norwood to give you the maximum in service and efficiency, at reasonable prices.

Investigate today. Tell us about your paper finishing problems, and ask for suggestions on how to solve them. We will help you.

THE NORWOOD ENGINEERING CO.
16 No. Maple St., Florence, Mass.

A GOOD START AND A GOOD FINISH WITH
NORWOOD
DEPENDABLE WATER FILTERS AND PAPER FINISHING MACHINERY

"READY DRESSED" MILL COGS

LABOR SAVING—TIME SAVING

THE MOST ECONOMICAL FILLING THAT CAN BE PUT IN A MORTISE WHEEL

WE MAKE ANY STYLE OR SIZE WANTED

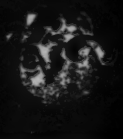
WRITE FOR INSTRUCTION SHEET "O" WHICH IS FREE

QUICK SERVICE ON ALL SIZES

THE N. P. BOWSHER CO., South Bend, Ind.

FULTON DRYER DRAINAGE
Systems
THE MIDWEST-FULTON MACHINE CO.
Dayton, Ohio

THE TRADE-MARK OF GOOD FELTS



The Waterbury Felt Co.
SKANEATELES FALLS N. Y.

HARDY S. FERGUSON & COMPANY
CONSULTING ENGINEERS
200 FIFTH AVENUE **NEW YORK CITY**

Hardy S. Ferguson—*Member A.S.C.E. A.S.M.E. E.I.C.*
Moses H. Teare—*Member A.S.C.E. A.S.M.E. E.I.C.*

Consultation, reports, valuations, and complete designs and engineering supervision for the construction and equipment of
- PULP AND PAPER MILLS
- AND OTHER INDUSTRIAL PLANTS
- STEAM AND HYDRO-ELECTRIC
- POWER PLANTS
- DAMS AND OTHER HYDRAULIC
- STRUCTURES

GEORGE F. HARDY
Consulting Engineer
305-309 Broadway, New York City, N. Y.
Member—Am. Soc. C. E.—Am. Soc. M. E.—Eng. Inst. Can.
Consultation—Reports—Valuations—Estimates—Paper and Pulp Mills—Hydro-Electric and Steam Power Plants—Plans and Specifications

---

SWENSON
EVAPORATORS & FILTERS for Pulp Mills
SWENSON EVAPORATOR COMPANY
15653 Lathrop Avenue
Harvey (Chicago Suburb), Ill.

PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Paper Cutter

Patent No. 2,187,827. Walter E. Eickman, Dayton, Ohio, assignor to Harris-Seybold-Potter Company, Cleveland, Ohio, a corporation of Delaware. Application December 15, 1937, Serial No. 179,936. 18 Claims. (Cl. 164—59). In a machine of the class described, a stop movable with the work, a stop fixed with respect to the work travel, said stops being adapted to engage each other when the work is advanced to a desired stop position and being movable relatively toward and away from each other in a direction at right angles to the work travel, and means tending to tilt one of said stops to swing its free end into position to jump the stop surface of the other stop as soon as said relative right angle movement permits, whereupon the work may be advanced beyond the said stop position.

Chip Packer and Spreader for Pulp Mills

Patent No. 2,187,330. Claus K. A. Rudd, Everett, Wash. Application March 30, 1938, Serial No. 198,954. 2 Claims. (Cl. 214—17). A chip distributor for pulp digesters comprising a base member, having means for suspension within the entrance opening of a digester, a casing on the base member, an electric motor on the base and housed by the casing, a yoke on the base having an upright shaft, a sleeve revolubly mounted on the shaft, a cone member fixed to the sleeve, said cone member having a ring gear upon its interior, a gear fixed to the drive shaft of the motor in mesh with the ring gear, the ring gear having an annular groove for reception of the upper edge of the casing, and said cone having helicoidal vanes upon its exterior surface.

Pulping Process

Patent No. 2,192,202. Floyd C. Peterson, Midland, Mich., and Louis E. Wise, Winter Park, Fla. Application October 23, 1936, Serial No. 107,144. 14 Claims. (Cl. 92—9). In a process for pulping raw lignocellulosic materials, the step which consists in digesting the same with a treating liquor comprising at least 70 per cent by weight of an alkylol-amine as an active pulping agent.

Paper Making Machine

Patent No. 2,186,761. Bernard A. Malkin, Lachine, Quebec, Canada, assignor to Dominion Engineering Works Limited, Lachine, Quebec, Canada. Application October 8, 1936, Serial No. 104,676. 5 Claims. (Cl. 92—44). In a paper making machine, a movable sheet forming element, a pond chamber of substantial vertical depth enclosed by top, bottom, front, rear, and side walls, said chamber being provided with stock inlet and outlet openings located a substantial distance below the top wall, means for supplying stock through said inlet so that the stock tends to rise in said chamber to a level above the top of the outlet, and means for introducing compressed air into the upper portion of said chamber for the purpose of controlling the depth and velocity of the stock immediately behind the outlet opening.

Method of Making Paper

Patent No. 2,192,488. Arthur Reilly, Westbrook, Maine, assignor to S. D. Warren Company, Boston, Mass., a corporation of Massachusetts. Application July 1, 1936, Serial No. 88,386. 8 Claims. (Cl. 92—21). Method of making paper comprising the steps of forming a paper web containing alkaline filler and a mordant, and then applying thereto as a surface size a size composition characterized by containing an ammonium resinate and resin regenerated therefrom, thereby forming an alkaline filled sized paper sheet.

Method of making paper comprising the steps of forming a paper web containing alkaline filler, and then applying thereto as a surface size a size composition characterized by containing an ammonium resinate and an ammonium salt, thereby forming an alkaline filled sized paper sheet.

Emptying Apparatus for Diffusers, Pulp Bins, and the Like for the Manufacture of Cellulose and Paper

Patent No. 2,185,567. Olaf Qviller, Oslo, Norway. Application October 27, 1937, Serial No. 171,396. In Sweden December 7, 1936. 8 Claims. (Cl. 92—7). A discharge device for diffusers and the like in the manufacture of cellulose and paper, comprising a casing having an outlet, a bell forming a valve controlling the outlet, means to supply water under pressure to the inside of the bell to actuate the bell for opening the outlet, a pivotal rinsing nozzle having an inlet connected with the water under pressure supplied to the bell and having an outlet controlled by the valve so as to be opened by the same during the valve lifting motion.

Suction Slice for Paper Making Machines

Patent No. 2,193,032. Kenneth J. Mackenzie, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey. Application January 16, 1937, Serial No. 120,968. 4 Claims. (Cl. 92—44). In a paper making machine, the combination with a making wire, of means for flowing stuff out over the wire, means for controlling the width of the flow of stuff on the wire, a combined slice and foam controller comprising a slotted hollow member, closed ends on the hollow member adjacent the means for controlling the width of the flow of stuff, said slotted slice and foam controller including an edge of said slot spaced above the bottom of the hollow member and lying substantially parallel thereto over which foam may flow, a pipe forming a part of the combined slice and foam controller extending into said slotted hollow member and passing upwardly therefrom, brackets mounted on the machine for adjustably carrying the said combined slice and foam controller for varying the position thereof relative to said making wire, and suction means for removing collected foam through the pipe in any set position of the slice and foam controller.

Calender Roll

Patent No. 2,186,679. Archibald C. Lade, Easthampton, Mass., assignor to B. F. Perkins & Son, Inc., Holyoke, Mass., a corporation of Massachusetts. Application March 18, 1937, Serial No. 131,620. 1 Claim. (Cl. 92—77). A calender roll of the class described comprising in combination, a rigid, central shaft, disc-like members disposed in adjacency on said shaft, said disc-like members being formed of fibrous material and having their outer peripheral portions impregnated with hardened plastic material, and means holding said members in tightly-pressed roll-forming relation on said shaft whereby they present a substantially rigid and unitary peripheral portion having a substantially hard peripheral surface and the roll has a relatively less hard and resilient area around said rigid shaft.

Paper Making Machine

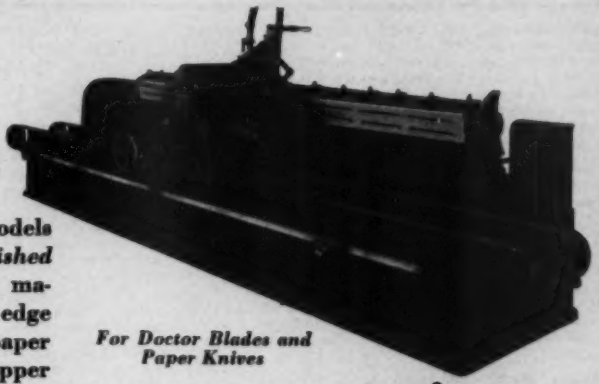
Patent No. 2,189,518. Ernst Gschwender and William C. Bigelow, Detroit, Mich., assignors to Detroit Sulphite Pulp & Paper Company, Detroit, Mich., a corporation of Michigan. Application March 14, 1938, Serial No. 195,855. 12 Claims. (Cl. 92—43). In a paper making machine, the combination with a rotary cylinder mold, of a pulp vat operatively associated therewith and comprising opposed complementary segmental side wall members disposed on opposite sides of the vertical plane of the axis of the cylinder mold and having hinge connection at their adjacent edges, means for simultaneously vertically adjusting said side wall members in their entireties relative to said cylinder mold, and means for independently adjusting the side wall members relative to said cylinder mold.

Paper Making Machine

Patent No. 2,185,913. George J. Forman, Montville, Conn. Application July 19, 1935, Serial No. 32,295. 1 Claim. (Cl. 92—44). In a paper-making machine, the combination of a stock flow box, a perforate cylinder on a horizontal axis paralleling one side wall of said box, an endless traveling belt extending partially around said cylinder and extending from said cylinder in horizontal upper and lower reaches, said cylinder and belt being located exteriorly of said box, a vacuum chamber within said cylinder for removing liquid from stock on said belt, two opposite side walls of the box extending beyond and overhanging said cylinder beside said upper reach of belt, means positioned beyond said cylinder preventing excess stock flowing over the upper reach of said belt between said opposite side walls, and a feeding apron projecting from the first-mentioned box wall into proximity to the belt around the cylinder in substantially the same horizontal plane of the cylinder axis and below said vacuum chamber.

KNIFE GRINDING

THE VALUE OF *proved* SUPERIOR SERVICE



For Doctor Blades and Paper Knives

The *promise* in the earlier design of the models here shown, has now become the *established standard* in the latest development of these machines, for strictly precision grinding, keen edge finish, wet or dry grinding of slitter knives, paper knives, doctor blades, barker knives, chipper knives, and all straight or bevel edge grinding, and universal slitter knife service.

• • •

For Slitter Knives

Superior, *proved*, service was never better exemplified than in these two machines, definitely establishing the better grinding standards for slitter knives, paper knives and doctor blades, which are now becoming the standards of the industry through the development and wide adoption of these machines.

Superior, economical, proved. Developed by the pioneers in the industry. Complete catalogue sent free upon request.

COVEL-HANCHETT CO.—Big Rapids, Mich., U.S.A.

KALAMAZOO

TILE CHEST

Adapted for Use with Agi-flo Pump

The Shartle Agi-flo agitates and delivers the stock. The Kalamazoo Glazed Tile Chest gives you the advantages of low cost storage and the utmost in cleanliness.

More than 700 installations of Kalamazoo Glazed Tile Tanks now in use prove their unvarying dependability. For maximum efficiency plan to use a Kalamazoo Chest with your next Agi-flo, or any other type of agitator.

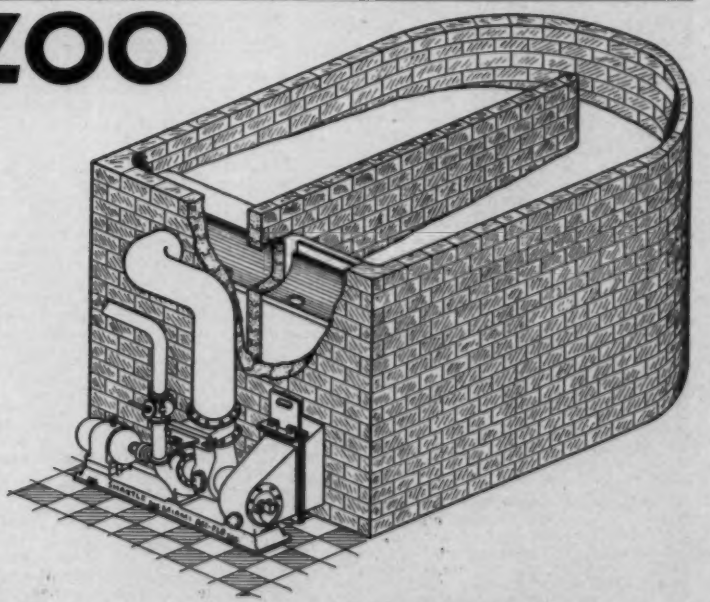


Illustration courtesy of Shartle Brothers Machine Company, manufacturers of the Shartle Agi-flo Pump

GLAZED TILE

KALAMAZOO TANK & SILO CO.

KALAMAZOO, MICHIGAN

WOOD

New Catalogues and Publications

Aston-Hill Mfg. Co., Philadelphia, Pa.—Characteristics of this company's dryer felts are ably presented in a new bulletin (No. 440) recently issued by the firm. The bulletin contains brief but concise written material covering the advantages, applications, characteristics and installation of the felts.

Bacharach Industrial Instrument Co., Pittsburgh, Pa.—Several interesting bulletins describing and illustrating this company's various types of instruments and indicators have been published lately. Bulletin 337 has to do with the company's "Fyrite" CO_2 indicator; Bulletin 279 is on the Type 2-CP engine indicator for recording pressures up to 1800 lb/sq. in. and Bulletin 280 explains the function of the "Premax" adapters for Diesel engines.

Bailey Meter Co., Cleveland, Ohio.—Pressure reducing and desuperheating control of the air operated type is the subject of a new bulletin (No. 107-A) issued by this company. The bulletin includes diagrammatic arrangements, installation photographs and detailed photos of individual control units. A partial list of installations includes pertinent data for each application listed.

Beaver Pipe Tools, Inc., Warren, Ohio.—Several types of pipe and bolt machines, including heavy duty, utility and portable models, are described in a new bulletin published by this company. Photographs and testimonial letters are included in this release, as are prices. Maintenance men will be interested in securing a copy.

Carlyle Johnson Machine Co., Manchester, Conn.—Revised data covering this company's standard and "Super-Johnson" type expanding ring friction clutch are included in a new booklet published by the company. All working features of the clutch are shown by cross-sectional drawings and there is much detailed information as to dimensions, prices, etc.

Carrier Corp., Syracuse, N. Y.—The adaptability of air conditioning to industry is amply illustrated in a new 16-page catalogue now available. Complete equipment is shown and there is much data covering every phase of the various units' advantages, application and operation. Capacity and dimensional tables are included in this interesting release.

Clark Controller Co., Cleveland, Ohio.—This company has published several interesting bulletins. One of the most interesting is devoted to explanation of the company's Type FS foot-operated heavy duty master switch, an improved design. Other bulletins cover the company's push-button stations and starters.

Cochrane Corp., Philadelphia, Pa.—Five different methods of liquid level control are described in Publication 2939. Complete descriptions of the operations and advantages of each type, together with tabulated data that includes operating characteristics and list prices, make this release one of interest.

Fairbanks, Morse & Co., Chicago, Ill.—A very interesting 16-page bulletin (No. 710) illustrating and describing this company's new line of Angleflow pumps in both vertical and horizontal types, is now available. Much new data concerning this new line of pumps is contained in this bulletin which uses photographs and written material to good advantage in describing all the new features and applications of the unit. Diagrammatic drawings and typical specifications are included.

General Electric Co., Schenectady, N. Y.—A new 20-page booklet entitled "Electronic Devices for Industry" has been published by this company. The booklet lists some of the more important vacuum-tube apparatus and describes their application and operation. It covers such devices as phototubes, d-c. motor control, pyrometers, exposure meters, etc.

Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.—This company recently announced publication of a new 64-page handbook and catalogue on industrial gaskets. The handbook (No. 53) obsoletes all previous literature of the company. It contains advanced engineering data, shows many new and improved products and gives complete size and price information. Well-illustrated and concisely written, it offers a valuable time-saving reference to those interested in industrial gaskets. A copy of the catalogue will be sent on request if made on company letterhead.

B. F. Goodrich Co., Akron, Ohio.—A four-page catalogue section on this company's line of transmission belting has been issued recently. The bulletin (No. 2100) describes the various types of belting as to construction and usages and includes prices.

A. P. Green Fire Brick Co., Mexico, Mo.—"Sairtest," an air-setting high temperature bonding mortar manufactured by this company, is described in a new folder (P-37) recently issued. Advantages and usages of this product are set forth by means of photographs and concisely-written material.

Hall Laboratories, Inc., Pittsburgh, Pa.—An interesting booklet describing seventeen case histories of plants serviced by this organization for scale and corrosion, has been published by the company. The case histories cover various types of mills and plants, including two paper mills and one paperboard plant. Through these case histories various problems of scale, corrosion, metal cracking or carryover are presented, all of which make interesting and instructive reading.

Hewitt Rubber Corp., Buffalo, N. Y.—A new folder on this company's transmission belts has been released lately by the firm. The folder includes a rubber belting price list, and tables showing hp. per inch of width, hp. correction factors, belt speeds, and arc of contact.

Link-Belt Co., Chicago, Ill.—A very attractive and informative publication entitled "Power Transmission Practice in Paper Mills" has been issued recently by this company. The 31-page book is a study of positive drive applications in paper mills as to first cost, efficiency, maintenance, machine application service and other factors. Excellent photographs and considerable data are important features of this release, together with well-presented written material covering each factor. It should be in every paper mill library.

Magnus Chemical Co., Garwood, N. J.—Two publications have been issued by this company recently. One release contains performance data outlining results of properly selected cleaning materials. This latter was compiled for the metal working and finishing industry. The other release contains interesting written material about the company's "Skin-Gard," a substance which, when rubbed on the hands, forms an invisible film which protects the worker against chemicals, solvents and dirt.

Mitts & Merrill, Inc., Saginaw, Mich.—This company has just issued a new circular illustrating and describing its hogs, chippers and shredders and showing their application to unusual grinding problems. The use of this equipment in paper mills and chemical plants is brought out in the bulletin (H-740).

Morse Chain Co., Ithaca, N. Y.—An informative 92-page catalogue on the Morse roller chain has been published by this company. The catalogue contains a wealth of data covering the chain and its parts; showing chain drive layouts, and data relative to calculations of chain length, sprocket diameters, dimensions of teeth and price lists. This catalogue should find a place in every industrial library.

Norma-Hoffmann Bearings Corp., Stamford, Conn.—A de luxe 27-page catalogue on this company's "cartridge" ball bearings has been released lately. The catalogue contains extensive informative material, brought out for the most part by numerous cross-sectional drawings showing construction and operation of this type of bearing. Two blueprints are included, as are advertisements showing actual application of this bearing.

Permutit Co., New York, N. Y.—A new bulletin (No. 2341) on Permutit hot process water softeners has been released lately. The thirty-two page bulletin contains many photographs and drawings showing the various types of softeners; their operation and design. This bulletin also contains installation photographs, in addition to well-written literature about the construction and usages of the equipment.

Poole Foundry & Machine Co., Baltimore, Md.—An interesting folder on this company's flexible couplings has been published lately. The folder contains written information as to the features of the couplings including materials, operation, installation and engineering data. Cross-sectional drawings and dimensional data are included.

Reeves Pulley Co., Columbus, Ind.—An interesting release on this company's variable speed control, including variable speed transmission, vari-speed motor pulley and vari-speed Motodrive, has been published recently. Many details as to the operation and advantages of these products are included in this release. Diagrammatic drawings serve to give the reader a clear idea of the company's products.

J. E. Rhoads & Sons, Philadelphia, Pa.—This company has published a handbook designed to aid those confronted with belting problems. The book contains descriptions of various problems and how these are solved by the correct use of the proper belting. Extensive examples are shown and much informative and valuable data is given. This would be a worthwhile book for any user of belting.

Roller-Smith Co., Bethlehem, Pa.—Catalogue No. 1230 issued by this company describes the firm's low voltage metal-enclosed air circuit breaker switch gear. The release, punched for loose-leaf filing, contains considerable data relative to the apparatus and also includes drawings of standard arrangements for the breakers.

Stearns Magnetic Mfg. Co., Milwaukee, Wis.—Magnetic disc brakes for control of electrical power for machinery, lathes, planers, hoists, and a variety of other uses, is the subject of Bulletin 604 recently published by this company. The 12-page release is punched for loose-leaf filing and contains numerous illustrations of the product itself in addition to installation views.

Tool Steel Gear & Pinion Co., Cincinnati, Ohio—An interesting folder on this company's gear and pinions has been issued recently. The folder explains why the company's products are called "Tool Steel," telling what the gears and pinions are composed of and presenting advantages in their use.

Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.—A new 12-page catalogue covering the "37" line of miniature panel instruments is announced by this company. The catalogue explains the features of these instruments such as dial readability, linear scales, etc. Operating principles are described and illustrations of the instruments, both individual and installed, are included.

BAUER SHREDDER

● **BREAKS UP LAP STOCK FAST, THOROUGHLY AND ON LOWER POWER INPUT.**

Why install expensive pulping machinery to break up lap stock when you can obtain like results with a Bauer Shredder?

1. Does not shorten fibers
2. Reduces beating time
3. Reduces maintenance cost on beaters
4. Capacity as much as 48 tons per day
5. Power input as low as ½ HP days per ton

Investigate.....At Once

THE BAUER BROTHERS CO.
SPRINGFIELD, OHIO

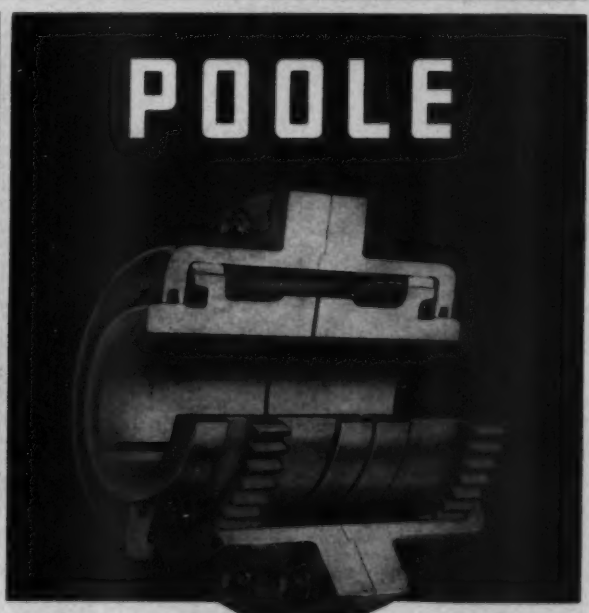
PARIS BLACKS

DIXIE AND KOSMOS PARIS BLACKS

Blacks known for their tone, strength and miscibility. They assure smooth, unvarying shades that last.

UNITED CARBON COMPANY
CHARLESTON, W. VIRGINIA

POOLE



A COPY OF CATALOG GIVING FULL DESCRIPTION AND ENGINEERING DATA SENT UPON REQUEST.

FLEXIBLE COUPLINGS

POOLE FOUNDRY & MACHINE COMPANY — WOODBERRY, BALTIMORE, MD.

CURRENT MARKET QUOTATIONS

RAGS (Domestic)
f. o. b. New York City

NEW RAGS — per cwt.

Blue Overalls	4.25 to 4.50
Corduroy	2.25 to 2.50
Cottons—	
Washables, No. 1	1.75 to 1.90
Fancy Percales	3.50 to 3.75
New Soft Blacks	3.50 to 3.75
New Light Seconds	1.60 to 1.75
New Dark Seconds	1.40 to 1.50
Khaki Cuttings—	
Mixed	2.50 to 2.75
O. D.	3.00 to 3.25
New White Canvas	7.50 to 8.00
New Mixed Blacks	2.25 to 2.50
Shirt Cuttings—	
New White No. 1	6.75 to 7.00
Silesias No. 1	4.25 to 4.50
New Unbleached	6.50 to 6.75
Fancy	2.00 to 2.25

RAGS (Domestic)
f. o. b. New York City

OLD RAGS

	per cwt.
Roofing—	
No. 1	.90 to .95
No. 2	.80 to .85
No. 3	.70 to .75
Twos and Blues—	
Repacked	1.60 to 1.75
Thirds and Blues—	
Repacked	1.40 to 1.50
Miscellaneous	1.10 to 1.20
White, No. 1—	
Repacked	3.00 to 3.25
Miscellaneous	2.50 to 2.75
White, No. 2—	
Repacked	2.50 to 2.75
Miscellaneous	2.00 to 2.25

RAGS (Foreign)
ex dock New York City

NEW RAGS — per cwt. — Nominal

- New Dark Cuttings
- New Mixed Cuttings
- New Light Silesias
- Light Flannelettes
- Unbleached Cuttings
- New White Cuttings
- New Light Oxfords
- New Light Prints

RAGS (Foreign)
ex dock New York City

OLD RAGS — per cwt. — Nominal

- No. 1 White Linens
- No. 2 White Linens
- No. 3 White Linens
- No. 4 White Linens
- No. 1 White Cottons
- No. 2 White Cottons
- No. 3 White Cottons
- No. 4 White Cottons
- Extra Light Prints
- Ord. Light Prints
- Med. Light Prints
- Dutch Blue Cottons
- French Blue Cottons
- French Blue Linens
- Checks and Blues
- Linsey Garments
- Dark Cottons
- Old Shopperies

ROPE and BAGGING
f. o. b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	2.35 to 2.50
Domestic	2.35 to 2.50
Wool Tares—	
Light	2.25 to 2.35
Heavy	2.40 to 2.50
No. 1 Scrap Bagging	2.00 to 2.15
Manila Rope—	
Foreign	4.75 to 5.00
Domestic	4.75 to 5.00
New Burlap Cuttings	2.25 to 2.50
Jute Threads—	
Foreign	3.25 to 3.50
Domestic	2.75 to 3.00
Strings—	
Sisal	2.25 to 2.50
Soft jute	3.00 to 3.25
Mixed	1.10 to 1.25

WASTE PAPER
f. o. b. New York City

	per cwt.
Shavings—	
White Envp. Cuttings	3.00 to 3.25
Ord. Hard White No. 1	2.40 to 2.60
Ord. Soft White No. 1	2.10 to 2.25
Soft White, Extra	2.50 to 2.75
Flat Stock—	
Stitchless	1.00 to 1.10
Overissue Mags	.85 to .95
Solid Flat Book	.75 to .85
Crumpled No. 1	.60 to .70
Solid Ledger Books	2.00 to 2.10
Ledger Stock—	
White	1.75 to 1.90
Colored	1.25 to 1.40
New B. B. Chips	.45 to .50
Manilas—	
New Env. Cuts	2.60 to 2.75
New Cuttings	1.85 to 2.00
Sulphite Mill Wrappers	.45 to .50
No. 1 Old Kraft	1.35 to 1.50
News—	
No. 1 Wh. News Cuttings	1.50 to 1.65
Strictly Overissue	.65 to .75
Strictly Folded	.55 to .65
No. 1 Mixed Paper	.42½ to .47½

CHEMICALS
f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	3.75 -
Ground, cwt.	3.50 -
Powdered, cwt.	3.90 -
Blanc Fixe—	
Pulp, bulk, ton	35.00 to 40.00
Dry, barrels, pound	.0300 to .0400
Bleaching Powder—	
Drums, cwt.	2.00 to 3.00
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	12.00 to 13.00
80-100 mesh (bags), lb.	13.00 to 14.00
Argentine, lb.	11.50 to 12.00
China Clay—	
Domestic Filler	
Bulk (mine) ton	8.50 to 15.00
Domestic Coating	
Bulk (mine) ton	12.00 to 22.00
Imported (ship side)	
Bulk (lump) ton	15.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	1.75 to 1.90
Gelatine (silicin), lb.	.55 to .65
Glye. (C.P.) drums, lb.	.1250 to .1300
Litharge, powd., bbl., lb.	.0750-
Rosin (Gum)—	
New York, per 100 lbs.	
E	2.20-
F	2.22-
G	2.22-
WW	3.17-
Rosin (Wood), carlots	1.40-
Salt Cake—	
Dom. bulk (wks) ton	16.00 to 17.00
Imp. bulk on dock—	
(Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works) cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—Ammonia,	
Solid, drums, cwt.	2.50 -
Ground and flake, drums, cwt.	2.75 -
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.85 to 2.00
40 deg., 25 gal. drums, (works) cwt.	.80 to 1.30
Starch—	
Pearl, 140 lb. bags, cwt.	2.95 -
Pearl, barrels, cwt.	3.05 -
Paper (Sp.) bags, cwt.	3.05 -
barrels, cwt.	3.15 -
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to 20.50
Talc—	
Dom. 100 lb. bags (mine) ton	14.00 to 17.25
Imp. bulk, ton (Nom.)	23.00 to -
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¼ to .05½
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	.07½ to .07¾

CHEMICAL PULP
(Air-dry ton)

	per cwt.
Soda (Dom.) del'd. mill—	
Bleached, contract	3.30 -
Open market	3.30 -
Sulphate (Dom.) f. o. b. mill—	
Bleached	4.00 to 4.25
Kraft No. 1	3.25 to 3.50
Kraft, Southern, del.	3.25 to 3.50
Sulphate (Imp.) on dock—	
Bleached	4.50 to 4.75
Kraft No. 1	3.50 to 3.75
Kraft No. 2	3.25 to 3.50
Sulphite (Fer.)	
On dock—	
Prime bleached	4.00 to 4.25
Prime easy bleach	3.75 to 4.00
Prime strong unbl.	3.50 to 3.75
Sulphite (Dom.)	
Bleached, contract	3.62½ -
Bleached, open market	3.62½ -
Unbleached, contract	3.17½ -
Unbleached, open market	3.17½ -

MECHANICAL PULP
(Air-dry ton)

	per ton
No. 1 Dom. & Can. (f. o. b. pulp mill)	34.00 to 37.00
No. 1 Imp. (On dock)—	
Moist	(nominal) 43.00 to 48.00
Dry	(nominal) 45.00 to 50.00

PAPER
f. o. b. New York City

	per ton
Boards—	
Binders	73.00 to 80.00
Chip	32.50 to 35.00
Chip, sgl. mia. lined	50.00 to 55.00
Coated, white patent .016	77.50 -
.020 and heavier	72.50 -
Kraft liner	55.00 -
News	32.50 to 35.00

	per cwt.
Book (coated)	
No. 1 Glossy Coat	11.50 to 13.50
No. 2 Glossy Coat	10.35 to 11.75
No. 3 Glossy Coat	9.55 to 11.00
No. 4 Glossy Coat	9.15 to 10.50
No. 2 Offset	7.70 to 9.00
A Grade M. F.	6.75 to 7.25
A Grade Super	7.00 to 7.50
B Grade M. F.	6.30 to 6.80
B Grade Super	6.55 to 7.05
B S. & S. C. Litho	6.80 to 7.30
B M. F. Litho	6.55 to 7.05
Ivory & India	.50 cwt. extra
Bonds (Rag Content)—	
100% Rag	
Ext. No. 1	39.10 to 46.00
100% Rag	31.05 to 36.80
85% Rag	
75% Rag	23.60 to 27.75
65% Rag	20.50 to 25.00
50% Rag	17.55 to 21.50
25% Rag	14.65 to 17.75
Regular Colors	1.00 cwt. extra
Bonds (Sulphite)—	
No. 1	8.95 to 11.00
No. 2	8.05 to 9.75
No. 3	7.60 to 9.25
No. 4	7.30 to 9.00
Colors	1.00 cwt. extra
Glassine (f. o. b. mill)—	
Embossed (25 lb. up)	13.75 to 14.00
Bleached (25 lb. up)	12.75 to 12.87½
Unbleach. (25 lb. up)	11.00 to 11.25
Greaseproof—	
Bleach. (25 lb. up)	10.50 to 10.75
Unbleach. (35 lb. up)	9.50 to 9.75
Ledgers (Rag Content)—	
100% Rag	
Ext. No. 1	40.25 to 47.25
100% Rag	32.20 to 37.75
85% Rag	29.90 to 35.00
75% Rag	24.75 to 29.00
65% Rag	21.65 to 26.25
50% Rag	18.70 to 22.75
25% Rag	15.80 to 19.25
Regular Colors	1.00 cwt. extra
Ledgers (Sulphite)—	
No. 1	10.10 to 12.25
No. 2	9.25 to 11.25
No. 3	8.50 to 10.75
No. 4	8.50 to 10.25

	per ton
News—	
Rolls (Contract)	49.00 to 50.00
Rolls (Spot)	(nominal)
Sheets	58.00 -

	per ream
Tissues (Carlots)—	
White, No. 1	.97½ -
White, No. 2	.75 to .77½
Anti-Tarnish M. G.	.90 to 1.05
Colored	.87½ to 1.10
Kraft	.85 to .90
Manila	.75 to .77½
Napkins, semi-crepe (12¼ lb. to M shts.) per cs.	.41 -
Napkins, full crepe and emb'sed (12¼ lb. to M shts.) per cs.	.43½ -
Toilet, Bleached (M shts.) per cs.	5.80 -
Toilet, Unbleached (M shts.) per cs.	3.60 -

	per case
Towels—	
Bleached	3.10 to 3.65
Unbleached	1.95 to 3.30

	per cwt.
Wrappings (Kraft)—	
Extra Quality	5.25 to 5.75
Super-Standard	4.87½ to 5.25
Northern Standard	4.25 to 4.75
Southern Standard	4.25 to 4.75

Wrappings (Sulphite and Bleached Kraft)—
(Rolls, f. o. b. mill)

	per cwt
Bleached papers—	
M. F. & M. G. Waxing, 20 lb. (Carloads only)	6.40 to 6.50
(10,000 lbs.)	6.60 to 6.90
Drug wrapp. 35 lb.	6.25 to 6.50
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	4.50 to 4.75
No. 1 Butchers	5.00 to 5.12½
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	5.50 to 5.75
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	5.25 to 5.50
Steam Finish, 50 lb.	4.00 to 4.25
Water Finish, 40 lb.	4.50 to 4.75
Manilas—	
Envp. Mia., Sub. 16-40 (No. 1)	5.25 to 5.50
Envp. Mia., Sub. 16-28 (No. 2)	5.00 to 5.25
Envp. Mia. (Prices based on large sheets untrim'd reammarked, in bdls.)	
Wrapp. Mia. 35 lb. up—	
No. 1	5.25 to 5.50
No. 2	5.00 to 5.25
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-25 lb.	6.00 to 6.12½
Grade B-25 lb.	5.50 to 5.62½